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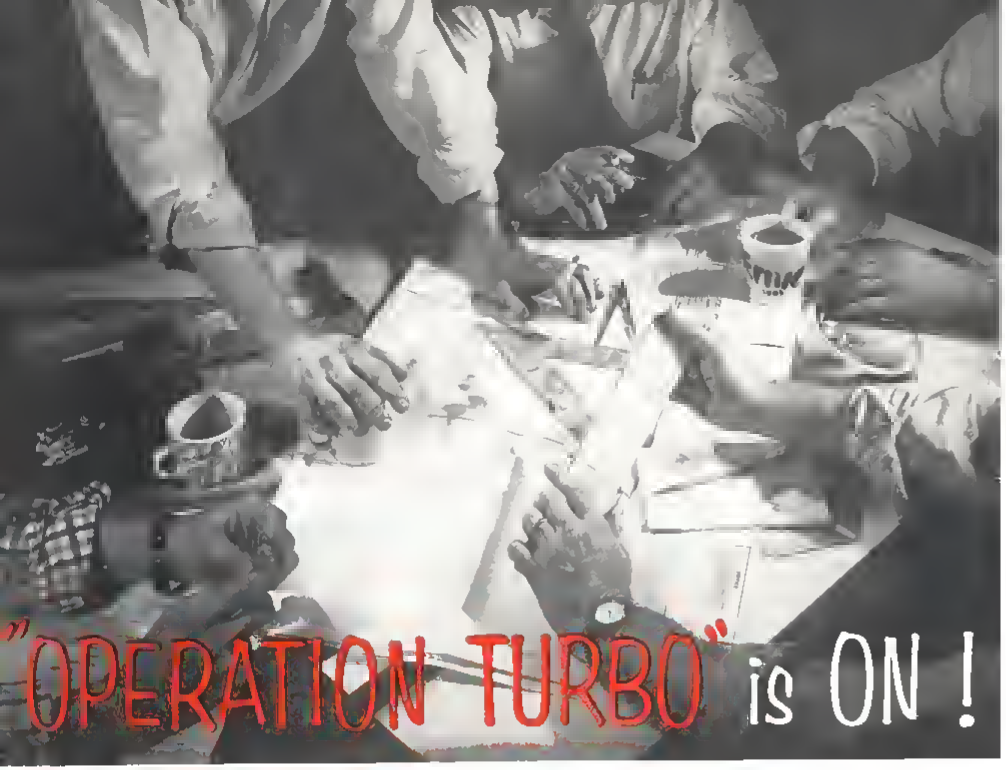

An intensive program of Turbo-Machinery development is under way at Hydro-Aire.

As in a war-time Task Force, the organization has been planned, personnel selected, equipment procured on the basis of maximum efficiency for the job to be done. The organization is new, the equipment the very latest that can be obtained. In contrast, the men themselves provide an accumulation of experience that goes back many years before Hydro-Aire came into being.

These men represent decades of research, development and practical operation in the field. One or another has held a key position with every leading turbine manufacturer in the country. Among the things that have attracted them to Hydro-Aire is the scope offered by this young, dynamic company. Perhaps for the first time in their careers they are free to give their abilities full rein to realize their full potential.

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We shall be glad to hear of any important work that you might wish to have included in their program.

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RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Boeing B-52 to land on strongest high-speed tire yet developed

THE B-52 heavy bomber has a gross weight of over 350,000 pounds. To land it at high speeds, the Air Force needed a tire that could take terrific impact and heat. A tire that greatly exceeds B-52 requirements and could take 50 landings at 200 mph on the dynamometer without failure. It was one of the toughest tests ever set for an airplane tire.

B. F. Goodrich engineers tackled the assignment. Using new techniques and rubber compounds, they came up with the largest capacity high speed tire yet developed. It not only passed the 50 landings test but was good for still more. And it passed maximum load-capacity dynamometer tests at low speeds. Cut apart for a post-mortem, it revealed *no sign* of failure. Result: the new BFG high-speed tire won official approval, is now being produced for all B-52's.

In addition B. F. Goodrich wheels and Expander Tube brakes were chosen as standard equipment.

The development of this new B. F. Goodrich high speed tire is typical of other BFG engineering accomplishments. The first low pressure airplane tire—the first high-pressure tire—and the first high-pressure tubeless tire were all B. F. Goodrich developments.

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B.F.Goodrich
FIRST IN RUBBER

Aviation Week

March 8, 1954 — Vol 60, No 10

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Domestic

Proposed merger of Continental and Pioneer Air Lines last week was approved by stockholders of the two companies (AVIATION WEEK Feb 8, p 85). Under the agreement, Continental will purchase PAL routes and assets with cash plus 65,000 shares of CAL stock. Final consolidation of routes and services is subject to CAB approval.

Crash investigators from CAB last week began probing the wreckage of a Western Air Lines Convair 240 that smashed into rugged hills near Newcastle, Wyo., Feb 26 while flying through a snowstorm from Los Angeles to Minneapolis. All nine persons aboard were killed.

Helicopter jet powerplant is being developed by General Electric Co's small-engine department at Lynn, Mass. General manager J. S. Parker says the XT-58 is approximately the size of an auto engine but seven or eight times as powerful.

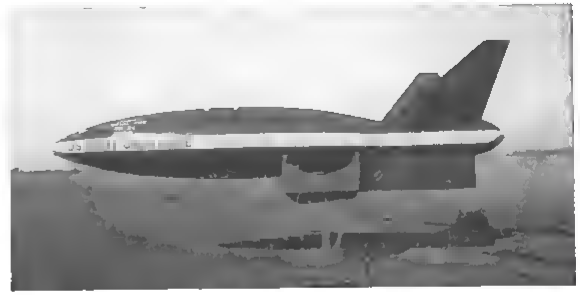
Lockheed Aircraft Corp. is negotiating with Air Force for purchase of USAF's multi-million-dollar plant at Marietta, Ga., plans to tool the factory for civil plane production if terms are worked out.

Northrop YF-89E, converted twin jet, all-weather interceptor, is being used as a flying test bed for the Allison YJ-71-A-3 engine.

Significant ruling handed down by the New Jersey Division of Tax Appeals holds that National Airlines transports are subject to Newark personal property taxes when they land at the city's airport and are grounded for limited periods.

Sperry Gyroscope Co's design and engineering force, comprising about 2,200, went on strike last week—first walkout in Sperry's history. Employes, represented by Engineers Assn., an affiliate of Engineers and Scientists of America (ESA), demanded a 15% wage increase. Company offered 2.5% increase for 1954, 2.5% for 1955, plus other gains and fringe benefits reported to bring the figure to a total of 6.3%.

Dr. Ralph Johnson, who became chief of Hughes Aircraft's research and development laboratories following a management walkout last fall, has resigned to take charge of the Research Division of Ramo-Wooldridge Corp., avionics producer formed by two former Hughes vice presidents. The new company is reported to be expanding following receipt of several important USAF contracts.



Tow Target for Supersonic Planes

First photo of Bellanca XM-24 aerial tow target designed to be towed at supersonic speeds at high altitudes for improving marksmanship of Army radar and anti-aircraft gun crews. The wingless 19 ft. long XM-24 is made of plastic and weighs approximately 200 lb. Flight tests of the new target are being conducted at Eglin AFB, Fla. It is designed to be towed at the end of a 5,000-ft. special cable and contains a parachute for recovery after the mission is completed (Aviation Week Mar. 1, p. 15).

Meletron Corp., Los Angeles manufacturer of aircraft pressure switches hit by fire in December (AVIATION WEEK Feb. 1, p. 18), expects to make up lost production by the end of this month, a company spokesman says.

Chester D. Seftenberg has resigned as USAF deputy assistant secretary for contract financing and Reserve and ROTC affairs to return to private business. No replacement has been appointed.

Business Flying magazine has stopped publication because of "rising costs and diminishing returns."

Gen. F. L. Martin, leader of the first round the world flight in 1924 and commander of Hawaii's Hickam Field when the Japanese attacked Dec. 7, 1954, died last month in Los Angeles. He was 71.

Panagra is rushing installation of an X-band military AN/APS-2 airborne radar in a DC-6B in an effort to beat Braniff International Airways for the distinction of being the first airline to put the weather warning device into regular service.

Financial

Douglas Aircraft Co., Santa Monica, Calif., reports net earnings of $18,586,305 from sales totaling $874,515,463 for fiscal 1953, compared with a $10,792,285 net and $555,619,409 in sales the previous year. Backlog as of Nov. 30, $2,214 million. The aircraft builder received orders for 88 DC-7s from seven airlines in 1953, delivered a combined total of 75 DC-6Bs and DC-7s to 16 air carriers during the year.

Consolidated Vultee Aircraft Corp., San Diego, had a net profit of $10,426,476 during fiscal 1953, a drop of $71,655 from the previous year. Net sales totaled $370,703,232, compared with $390,997,843 for 1952. Backlog Nov. 30 exceeded $1 billion.

International

Jet plane plant will be up in Japan under an agreement signed by Lockheed Aircraft Corp. with Kawasaki bomber factory for production of F-94C all-weather fighters and T-33 trainers. Kawasaki also will manufacture and repair jet powerplants under a contract being negotiated by Lockheed and General Motors' Allison Engine Division.

Indian Airlines DC-3 crashed Feb. 25 during flight tests to determine the cause of a previous transport accident near Nagpur in December. All three persons aboard were killed.

New Oryx turbogas generator is being produced by Britain's D. Napier & Son, will be used to power helicopters by providing thrust at the rotor tips.

The Aviation Week

March 8, 1954

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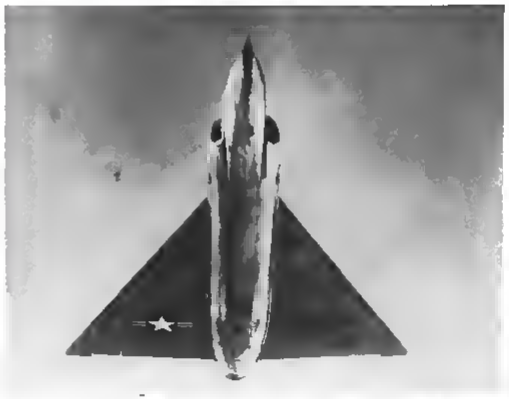
9—USAF 14-16—Boeing Airplane 17—Convair

CONVAIR YF-102 supersonic all-weather USAF interceptor, reveals delta wing configuration resembling its research predecessor, the XF-92A that the company built for the Air Force in 1948. The YF-102 is powered by a P&WA J57 engine with an afterburner.

AF Shows New Supersonic Convair YF-102



AIR INTAKES are on either side of YF-102 cockpit, in contrast with XF-92A, which has single intake in nose for its jet engine.

CLAM-SHELL CANOPY open, the YF-102 rests on Edwards AFB runway. Nose probe mounts devices for gathering flight test data.

YF-102 TAKES OFF from Edwards with nose wheel high as plane gathers speed. First prototype was completed Oct. 5, 1953, and damaged in an emergency landing Nov. 2. Second YF-102 prototype has been undergoing flight tests at Edwards since mid-December.

WHO'S WHERE

In the Front Office

Malcolm S. Mackay has been reappointed executive vice president of Northwest Orient Airlines, a post he relinquished two years ago when Harold Harris was elected NWA president. Mackay, former vice president in charge of the Continental Division, had been acting chief executive since Harris took a leave of absence because of illness in January.

Mrs. T. E. Braniff, widow of the late president of Braniff International Airways, has been elected a vice president of the airline.

Brig. Gen. Thetus C. Odom has assumed command of the San Antonio Air Materiel Area at Kelly AFB, Tex., succeeding Maj. Gen. Clements McMullen, who has retired.

Adm. Ralph E. Jennings (USN Ret.), executive vice president of Doman Helicopters, has been elected a director of the Danbury, Conn., company.

F. T. Smye is new vice president and general manager of A. V. Roe-Canada's Aircraft Division, and **W. R. McLachlan** has been appointed vice president and general manager of the Gas Turbine Division.

Changes

Dr. William G. Brombacher has retired as chief of the mechanical instruments section of the National Bureau of Standards, Washington, D. C.

Louis W. Davis has resigned as director of public relations and advertising for Air Associates Inc., Teterboro, N. J., to undertake other editorial and public relations activities.

W. L. Fabro has become director of passenger services for Trans-Canada Air Lines, and **J. L. McLellan** is new director of TCA station services.

Henry Magnuski has been promoted to associate director of research for Motorola's Communications & Electronics Division, Chicago. Other changes: **Lloyd P. Morris**, chief engineer for the new National Radio Systems Consulting Service, **Harold A. Jones**, executive assistant to the national sales manager.

Rex Hardy, Jr., has resigned as chief of Northrop Aircraft's missile section at Hawthorne, Calif.

Kenneth P. Schmidt is new director of labor relations for Curtiss-Wright Corp., and **Carl G. Tebbe** has been appointed industrial relations manager for the Wood-Ridge, N. J., company's Wright Aeronautical Division.

C. W. Greaves has been promoted to special assistant to the manager of Convair's San Diego Division.

John M. Stoddart has become advertising and sales promotion manager for Resort Airlines.

Honors and Elections

C. H. Dickens, sales director of de Havilland Aircraft of Canada, has been honored by the Alberta Geographic Board, which will name a lake after the aviation pioneer.

INDUSTRY OBSERVER

► Russia has phased out large-scale production of the MiG-15 jet fighter and has tooled up the same factories that built these planes for large-scale production of a new and better jet interceptor.

► **USAF expects to spend $100 million on its F-86D modification program. North American Aviation's share will be about $25 million, with the remaining $75 million split between Hughes Aircraft on fire control systems, General Electric on jet engines and Lear on autopilots.**

► Piasecki's YH-16 helicopter has flown faster than 100 mph. in its early flight test program. Gas turbine-powered version of this helicopter, the YH-16A, is nearing completion at the Morton, Pa., plant and is expected to fly before the year's end.

► **USAF and Navy are using an experimental 5,000-ft. landing strip near the North Pole constructed of packed snow. Originally built by Navy Seabees landed by ski-equipped C-47s, the strip now is handling transports with conventional wheeled landing gear.**

► Military buyers of the Sikorsky S-56 twin-engine helicopter estimate that early models will cost close to $1 million each but that when large-scale production is under way the cost will come down to about $800,000. They point out that this is about the current cost of a commercial Convair Liner and the S-56 will carry the equivalent transport load over short hauls.

► **Watch for Lockheed to attempt to break the transcontinental west-east speed record with its T-33B jet trainer. Although the T-33B is powered by an Allison J33-A-16 turbojet producing more than 7,000 lb. thrust, Mach limitations of the aircraft make it unlikely it will beat the recent mark of 4 hr. 8 min. 5 sec. set by a North American F-86F.**

► Convair is developing a long-range ballistic missile known as the Atlas. Its development was begun in the era when Floyd Odlum's Atlas Corp. was the controlling stockholder in Convair.

► **Aircraft Industries Assn. and Air Transport Assn. plan to work closely with the British Air Registration Board in developing airworthiness requirements for transport helicopters.**

► Increasing use of pneumatics to power aircraft auxiliary systems is indicated by Douglas use of a pneumatic system on its YC-124B turboprop Globemaster. The YC-124B uses pneumatics for engine starting, cockpit pressurization and auxiliary power.

► **Royal Air Force formed its first squadron of sweptwing fighters last month—about eight months behind schedule. The squadron is equipped with Supermarine Swift F.1s, all of which will be modified later to the F-4 configuration. Meanwhile, RAF is using F-86 Sabres built by Canadair under license from North American Aviation as its first-line operational fighter.**

► Late reports on the fire in the Britannia prototype (AVIATION WEEK Feb. 15, p. 92) indicate that the initial blaze occurred in the tailpipe section of the inboard Proteus 3 turboprop on the right side where it is still buried in the wing. Observers recalled that the prototype Vickers Valiant bomber crashed a year ago after a fire broke out in one of its wing-buried jet engines.

► **Boeing's F-99 Bomarc air defense missile is powered by a Marquardt ramjet engine, uses Aerojet-General rocket power for takeoff.**

► First production Boeing B-52 Stratofortress is due to roll out this month.

► **Kellett Aircraft Corp. expects to begin a flight test program soon on its modernized autogiro (Aviation Week Aug. 17, 1953, p. 420) to obtain stability and control data applicable to convertiplane problems.**

AVIATION WEEK VOL 60, NO. 10 MARCH 8, 1954

House Restores Half of Airline Subsidy Cut

- **Appropriations Committee changes $50-million slash, allows CAB money for payments until spring of '55.**
- **Board says analysis shows its original $73-million request for the new year was 'conservatively low.'**

By Katherine Johnsen

Outlook for airline subsidy appropriations was brighter last week after the House Appropriations Committee changed the drastic $50 million reduction it originally made in the $73 million requested by Civil Aeronautics Board and allowed money to take care of payments until spring of 1955.

This means the subsidy appropriation has passed in reasonably satisfactory form its stiffest test in Congress. The Senate consistently has been more liberal on civil aviation appropriations than the House.

The committee explained the $50-million slash was made "in view of the far-reaching nature" of the Supreme Court decision requiring that domestic airline earnings be used to offset international subsidy requirements (AVIATION WEEK Feb. 8, p. 13).

► **Reactions**—After this action, leaving only $23 million for fiscal 1955 subsidy payments, there were these developments:

• A CAB memorandum analyzing the probable effects of the court's offset profits decision showed the $73 million requested was "conservatively low."

• The committee agreed to an increase in the appropriation from $23 million to $40 million. An estimated carryover of $8 million will boost this to $48 million on hand for subsidy payments. The fact that this is substantially less than $73 million, however, is not expected to affect subsidy payments. The figure contemplated monthly payments of $6 million over a 12 month period.

The committee recognized this monthly requirement and granted sufficient money for an eight month period to Mar. 1, 1955. By the beginning of next year, it was reasoned, CAB would have firmer estimates on its subsidy requirements and a supplemental appropriation could be made for the period from Mar. 1 to July 1, 1955.

► **Notice to Airlines**—Air Transport Assn.'s general counsel Stuart Tipton, considered the most significant aspect of the House committee's action as "notice to the airlines and the Board that a close watch is being kept over subsidy payments and that they must be justified."

Rep. John Taber, chairman of the full Appropriations Committee, and chairman Cliff Clevenger of the Commerce Subcommittee viewed the reduction as a "postponement" in making money available and not as a move to eliminate CAB-approved payments to airlines. However, under the $23 million originally proposed, CAB, at its estimated rate of $6 million monthly in payments, would have run out of funds by November, when Congress was in adjournment.

Rep. John Rooney, ranking Democrat on the Commerce Appropriations Subcommittee, chided that the economy efforts of the committee's Republicans had "brought forth not an elephant but a mouse" in pointing to the airline subsidy reduction as "merely deferment of payment."

► **TWA Reduced**—Trans World Airlines is the only carrier whose subsidy allocation will be reduced as a result of the Supreme Court decision, according to CAB's analysis.

The Board stated: "Based upon the reported earnings of TWA on its domestic division for calendar year 1953, it appears that there might be available approximately $1.5 million which could be offset against the estimated subsidy for its international division." The estimated subsidy for TWA's 1955 fiscal trans-Atlantic operations is $4.4 million. The $1.5 million offset would reduce this figure to $2.9 million.

Concerning the six other carriers affected by the decision, CAB reported:

• **Braniff Airways** "is currently operating on open rates in both its domestic and international divisions and apparently requires subsidy in both divisions. No question of excess earnings for offset purposes is involved. There is no likelihood of reduction of the estimated international subsidy for Braniff for fiscal 1955 as a result of the case."

• **Alaska and Colonial Airlines**' situations are the same as the Braniff situation, the Board said, except that these two carriers are on final rates.

• **Delta-C&S Airlines**: A 1953 order estimated Delta's domestic earnings at $700,000 in excess of an 8% return on investment. CAB now estimates Delta "will require subsidy for fiscal 1955 in its domestic operations" and have no earnings to offset its international subsidy.

• **Northwest Orient Airlines**, it was pointed out, earned less than 8% in domestic operations on a 53-cents-a-ton-mile mail rate. The fact that the carrier was put on a 45-cent mail rate Jan. 1 even lessens the prospect for excess domestic earnings, the Board observed.

• **Pan American World Airways**: Consideration of the carrier's earnings as a whole instead of individually considering those of its four divisions, CAB said, "does not appear at this time will decrease the overall subsidy requirement." On the contrary, the Board estimated PAA's Pacific Division subsidy of $7.8 million for fiscal 1955 is $700,000 understated. In reaching the estimate, the Board counted on $2.7 million earnings from the Korean airlift, since canceled.

CAB also made these points indicating that more than the $73 million estimate might be required for fiscal 1955 subsidies:

• Northwest's Pacific subsidy has probably been underestimated by about $800,000 since cancelation of its earnings from Korean lift operations was not anticipated.

• Based upon petitions of local service airlines, "it now appears that an additional amount of approximately $2.8 million might be required for them ."

The Board declared that, according to current facts, "the amount involved in the offset principle (TWA's $1.5 million) is more than outbalanced by increases in subsidy requirements stemming from other causes."

► **Rooney Criticism**—House Appropriations hearings on airline subsidies were generally congenial except for critical questioning by Rep. Rooney, primarily on TWA and Pan American.

Rooney presented allegations that TWA's routing of its No. 960 New York-London flight by way of Keflavik is costing more than $1.8 million additional annually and that "this money would have to be made up to TWA in the form of direct subsidy." The routing eliminates the requirement for a navigator.

Trans World initiated the routing "with the complete approval of Civil Aeronautics Administration," a spokesman said, following a three week walkout of its navigators ordered by the Transport Workers Union (CIO) last summer.

"We wanted to develop an alternative to sustain operations in case this should happen again," he said.

► **Union Fight**—The TWU aggressively has fought airline subsidies. The union sent this notice to members of the Appropriations Committee: "Our organization representing 15,000 airline workers asks that you examine carefully the record-breaking airmail payments being requested by CAB. These hidden subsidies have frequently been used against organized labor and are so being used today."

Air Line Pilots Assn. (ALPA) supports government subsidy to develop domestic and international air transportation in the ground that employes benefit from a thriving industry.

► **Mail Rate Challenged**—Rooney's suggestion that consideration of Pan American mail rates on a company basis instead of on a divisional basis would result in great savings was challenged by CAB witnesses.

Irving Roth, chief of the Rates Division, commented: "In my opinion, it would result in an increase in the subsidy payments because on a system basis I do not believe there is any airline in the world that we could say is reasonably comparable with Pan American, but when we break PAA down into pieces we can then start to compare and have a yardstick to compare PAA with other operators."

Rooney requested CAB to file a listing of Pan American non-operational investments.

PAA Increases '54 Sales Quota 10%

Pan American World Airways has set an increased sales quota of 10% over 1953, Willis G. Lipscomb, vice president traffic and sales of the airline has revealed.

Speaking from New York over a nationwide closed-circuit television network, Lipscomb told PAA travel agents: "We do not agree with the bearish stories that are emanating from some sources. We are very bullish about the prospects for business in general for 1954 and for travel in particular."

Sonic Boom: A Potential Weapon?

NAA study finds shock waves can knock lightplanes out of air, batter ground structures and create panic.

By William J. Coughlin

Los Angeles—Shock waves from supersonic aircraft such as the F-100 may have sufficient force to knock a lightplane out of the air and are potentially useful as an offensive military weapon, according to engineers at North American Aviation.

To avoid danger to other aircraft in the air, new NAA flight regulations forbid company pilots from flying supersonically within 5,000 ft. of private planes or commercial transports.

► **Serious Problem**—The North American study of shock waves is one of the most complete undertaken in this country and the first to indicate publicly that the increasingly familiar "sonic boom" may be potentially dangerous.

It is a very serious problem," says Raymond H. Rice, vice president and chief engineer of the company. "Light planes, light structures could definitely be endangered by shock waves from supersonic aircraft."

"If you buzz a Piper Cub supersonically, you might split it open," warns H. A. Storms, Jr., NAA chief technical engineer.

Safety Rules—North American builder of the nation's first supersonic production fighter, has been studying shock wave effects closely in its flight tests of the F-100. The new safety regulations are a result of that study.

In addition to the 5,000-ft. rule, the regulations include:

• **Level supersonic flights always must be made at an altitude above 10,000 ft.**

• **Supersonic dives are forbidden within 15 miles of any inhabited area.**

► **Offensive Weapon**—Rice believes shock waves produced by low-flying supersonic aircraft may have some value as an offensive military weapon.

Pointing out that shock waves of the order of 50 lb./sq. ft. may be expected in the not too distant future, he notes that this pressure would correspond to a hurricane of 140-mph. velocity.

Although the duration of a hurricane is longer than that of a supersonic pressure jump, its buildup is gradual compared to the shock and oscillatory nature of a supersonic boom.

► **Vulnerable to Attack**—"Lightly built structures that are always found in large, populated areas may prove to be exceedingly vulnerable to this type of attack," North American's chief engineer comments. "The simultaneous failure of thousands of windows, with the attendant flying pieces of glass, is not pleasant to contemplate. Furthermore, radar detection at low altitude may be extremely difficult and there may be no warning whatever until the shock is felt. The effects of panic would be enormous."

With this type of attack, the explosive store part of the logistic problem will be greatly simplified since the former will not be needed. Also, for this reason, the operating radius for this type of aircraft can be greatly increased."

► **Best Efficiency**—An aircraft designed for such an attack should have a sea level speed of between Mach 1.2 and 1.5 for best efficiency and should be as large in cross sectional area as possible consistent with the ability to achieve the desired Mach number, according to Rice.

Anyone who observed the press demonstration of the F-100 that shattered the USAF administration building at Palmdale, Calif. (AVIATION WEEK Oct. 26, p. 12) would agree to the potential value of a shock wave as a possible panic weapon.

► **Skill, Planning**—"Lest I cause some to worry unnecessarily about low-flying, friendly aircraft," says Rice, "it should be understood that low-flying at supersonic speed takes a great deal of pilot skill and advance planning. It is almost inconceivable that this could ever be done inadvertently and it is certain that irresponsible people would never be permitted to control such machines of destruction."

Although it is unlikely that shock waves could do any more at present than rock a heavier aircraft slightly, North American's engineers believe it is necessary for military pilots to exercise caution when flying in the vicinity of any fabric-covered aircraft.

George Welch, NAA's senior engineering test pilot, reports he has flown the F-100 past an F-86 at well over Mach 1 without any adverse effect on the Sabre.

"As a matter of fact, he didn't feel anything," says Welch.

► **Bigger Wave**—When larger aircraft begin flying supersonically, the problem might increase, according to one NAA expert. "The bigger the aircraft going through the sonic barrier, the bigger the shock wave will be," he says.

But higher Mach numbers do not necessarily mean a proportionally greater sonic boom, according to technical engineer Storms.

"Once you get supersonic it doesn't make too much difference how supersonic you are," he says. "Mach 2 does not mean twice the sonic boom of Mach 1."

NEARLY COMPLETED BOEING 707 jet transport in Renton, Wash., plant being readied for rollout this June, flight in September.

Boeing 707 Jet Transport Nears Rollout

Seattle—Boeing Airplane Co.'s prototype Model 707 jet transport is nearing completion at the company's Renton plant with rollout set for June, taxi tests in August and first flight shortly after Sept. 1.

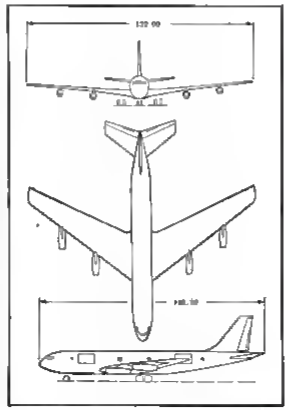
The first U. S. jet transport is designed as a military cargo prototype, and Boeing vice president-engineering Edward C. Wells comments: "This definitely is a tanker-transport airplane."

William M. Allen, Boeing president, points out that no effort has been made yet to sell the 707 to airlines, that no price for the plane has been quoted to carriers.

Designed to cruise at 35,000 ft. or more, the new plane is capable of carrying 80-150 passengers, the company says.

▶**Engine Variety**—While the prototype will take four pod mounted Pratt & Whitney Aircraft J57s, the transport has been engineered to use the Wright J67 and the British Rolls Royce Conway, Bristol Olympus and some newer R-R Avons, Boeing has announced.

707 MODEL displays sharply swept wings, separate pod mounting of P&WA J57 jets.



THREE-VIEW of new 707 configuration.

SQUARE WINGTIPS AND TAIL are evident in view from beneath 707 scale model.

(Statistics and specifications for the 707 were published by AVIATION WEEK June 29, p. 12.)

Allen says one of the reasons the company went into the project was that "we felt it was a plane that was needed by the military for the B-52 and also the B-47." He adds that the jet tanker-transport is "almost a military necessity."

Boeing is confident of military orders, although none yet has been received.

Allen says it will take three years to get the 707 into production following receipt of orders.

▶**Philosophy**—Wells says the 707 will be economically comparable to present four-engine airliners. "Our philosophy is to provide maximum performance in an airliner that can operate with reasonable economy. From what we have learned from the B-47 and the B-52, we believe we can compete and have the advantage of jet performance without paying what some people might believe is an excessive penalty for that performance."

Boeing says the aircraft represents a private investment of more than $15 million.

▶**Demonstration**—The plane producer plans to use its first U. S. jet transport in demonstration flights for both the military and for commercial airlines.

"In its military version, as a multi-purpose tanker-transport for the armed forces," Boeing says, "the fast, high-flying jet will make possible greater range, striking power and mobility for America's present and future jet air fleets.

"As a commercial airliner, the new Boeing will be capable of regular transcontinental nonstop flights in less than five hours, nonstop New York-to-London schedules of less than seven hours."

▶**550-Mph. Class**—Specifications that accompany photographs of the prototype and models of the jet liner parallel data released last summer to potential airline customers.

Cruising speed of the 128-ft.-long transport will be in the 550-mph. class, and gross weight is estimated at 190,000 lb. fully loaded. Wings have a normal sweepback of approximately 35 deg. and measure 130 ft. from tip to tip.

Payload will be approximately 25,000 lb., and the new transport will carry from 80 to 150 passengers, "depending on the range and payload requirements of various operators."

▶**Few Windows**—The prototype has a flight engineer's station mounted on a swinging panel so it can be pulled behind the pilot and co-pilot for plane operation by a two-man crew. Cockpit visibility is good.

There are very few windows in the prototype. There are two large cargo doors on the left side, along with four small oval windows. There are seven small oval windows on the right side: five clustered ahead of the wing, one in the center and one near the tail.

First flight will be from the Renton Municipal Airport, which has a 5,480-ft. strip. Pilot probably will be A. M. (Tex) Johnson.

Air Force Grounds J57 Temporarily

USAF last month grounded for a week all production and prototype models of Pratt & Whitney Aircraft's J57 engine.

Air Force would not reveal the exact reason for grounding the jet engine but said it was due to a minor change involving the use of a heavier sheet metal part, describing the action as routine for a new engine.

Industry observers identified the source of the problem as the compressor section. But P&WA would not specify the part being changed.

The engine now is being used in the North American F-100, Convair F-102, Boeing B-52 and Douglas F4D and A3D. The J57 also is scheduled to power Boeing's Model 707 jet transport and McDonnell's F-101.

A P&WA spokesman says: "There has been no service trouble encountered with the J57 engine, and there has been no significant holdup in either flying or production. As a result of factory testing continuously carried on with all engines, an improved part is being incorporated in the J57 by an engineering change.

"At Pratt & Whitney Aircraft's request, field inspections have been made of all delivered engines. The improved part is being incorporated in all engines, either now or later at first overhaul."

CAB Safety Bureau Trims to 2 Regions

Civil Aeronautics Board's Bureau of Safety Investigation is combining its eight investigative regions into two areas, but BSI's organizational structure will not be altered materially.

Eighty-seven employes will be eliminated and the new move is expected to save the Bureau $35,000-$40,000 this fiscal year. Bureau Director W. K. Andrews says all field offices will be retained at their present locations. However, transfer of light-plane accident investigations to Civil Aeronautics Administration (AVIATION WEEK Dec. 14, 1953, p. 17) will bring about some functional changes.

▶**Headquarters**—The bureau has designated Oakland, Calif., and Washington, D. C., as headquarters for the Western and Eastern Areas to which its operations have now been limited.

The Western Area will include Anchorage, Alaska, Seattle, Oakland, Santa Monica and Fort Worth offices. Jurisdiction extends roughly from the West Coast to the Rocky Mountains and includes Alaska.

The Eastern Area includes New York, Atlanta, Miami, Chicago and Kansas City offices.

Leon D. Cuddeback, former chief of the Seattle office, has been named acting supervisor for the Western Area. He is succeeded at Seattle by F. K. McKiveen.

J. N. Peyton, Investigation Division chief in Washington, heads up the Eastern Area.

U. S. Maps Second Berlin Airlift

State Department dickers with several lines on setting up Berlin-Hanover aircoach service with AF C-54s.

By Richard Balentine

U. S. State Department is considering a second Berlin airlift to operate under different precepts than its famous predecessor of 1948.

This time an airlift is aimed at counteracting Russia's continued harassment of surface traffic through the Soviet Zone of Germany between the Allied Western Zone and West Berlin. Result could be the reorganization of the entire transport picture of West Germany.

▶**USAF Planes**—State Department is discussing the possibility of providing nonstop air tourist passenger service between Hanover and Berlin using U. S. Air Force aircraft operated by a commercial airline. Freight also may be carried across the new airlift.

When the proposal is approved competitive bids will be sought to award the contract. The West German government is understood to be encouraging the idea because it would provide a cheaper and safer method of transportation between the two Allied zones.

Surface travel through the Soviet Zone presently is hampered by these restrictions:

- Soviet Zone railway administration receives a sizable percentage of passenger fares as a travel fee.
- Russians can and do remove passengers from East Zone trains for the slightest infraction of their regulations.
- Trucks have been delayed interminably at different times while cargoes and bills of lading were given item-by-item inspection.
- Canal traffic has been blocked by Russian interference.

The Soviet fee on railway fares, although not a recent innovation, is pouring dollar-backed West German marks into the Soviet coffers. The Russians claim the fee pays for use of Soviet railway track and the locomotives they switch to all trains traveling through the East Zone. Soviet engines are switched to trains at Helmstedt, the east-west border inspection point.

▶**Delays, Removals**—Insecurity of travel through the East Zone is a source of much irritation, particularly to Germans wishing to travel from the Allied zones to Berlin. Some passengers have been removed from railway cars and never heard of again.

Trucks and passenger cars also have suffered at the hands of Russian inspectors along the German Autobahn. Truck convoys have been delayed for days while Russian officials decided on newly adopted transport policies.

Several times canal traffic has been blocked at Magdeburg when Russian guards complained that locks had broken down. Repairs took just long enough to delay important freight.

▶**40 Trips Daily**—State Department officials see the proposed aircoach service as a means of avoiding many current problems with the Russians. Preliminary plans call for the use of eight USAF C-54s. They would fly an estimated 40 trips a day.

Several airlines, including Pan American World Airways, now furnish 35 to 40 first-class flights per day between the two cities. PAA is known to be considering the new airlift, although rates appear to be the principal problem at this point. Several American nonskeds are expected to be interested in the proposal.

State Department admits to dickering with several airlines for the new service, although interested companies will be invited to submit bids on the project. Cost of the operation will be backed by the West German government.

▶**MATS Operation**—Harassment of surface traffic has been sporadic since May 1949 when a United Nations agreement permitted both east and west transportation and communication facilities as they existed prior to the original Berlin blockade of 1948.

Success of the first Berlin airlift, which began that year, has been a major factor in consideration of the new service. At that time, all ground traffic was stopped for a year. Military Air Transport Service operated a giant airlift which countered the Russians' blockade and brought it to an end. The airlift was concluded in the spring of 1949.

▶**Talking Stage**—In 1951, certain West Berlin manufacturers, in order to compete successfully with West German industry, contracted with Air France, British European Airways and Pan American to fly their products to the west. Subcontractors were employed.

Bulk of that operation lasted only six months although there is still some cargo service operating.

Navy Censorship

New security instructions have not been issued by Navy's Bureau of Aeronautics, although recommendations were submitted by the Department of Defense more than a month ago for changes in BuAer's crippling directive (AVIATION WEEK Jan. 3, p. 15).

We expect to have a revised directive ready in about two weeks," a BuAer spokesman says.

The original, strictly interpreted, made normal news coverage of Bureau of Aeronautics' activities virtually impossible.

Recommendations to change the directive came after AVIATION WEEK's article was shown to Assistant Defense Secretary Fred Seaton. He ordered that the directive be revised. Navy defended it as a sincere attempt to carry out President Eisenhower's executive order on release of information.

Navy spokesman would not reveal the extent of the revision under way.

American Will Spend $40 Million in 1954

American Airlines will spend $40 million for new planes and other capital equipment during 1954, W. J. Hogan, AA senior vice president-finance, forecast last week.

Hogan also predicted that air transportation will continue to be one of the leading growth industries for many years.

"While we do not have final data for February," he said, "passenger miles in January were 16% above those of the previous January in spite of the adjustment in general business activity."

▶**Coach Growth**—Approximately one-third of the growth in American's passenger traffic since 1949 has been in coach flights, and at the present time 20% of passenger miles are in the coach category, he reported.

"Of American Airlines' total revenues, between 85 and 90% are derived from passenger traffic." Hogan told the Boston Society of Security Analysts. "Since 1950 passenger travel has increased by 82%, mail ton-miles by 71% and freight ton-miles by 50%. We expect that our equipment sales effort and route structure will result in continual traffic increases."

C-124B Engines, Props

The Douglas YC-124B Globemaster, which made its first flight last month, is powered by four Pratt & Whitney Aircraft T34 turboprop engines turning three-blade Curtiss Turbolectric propellers. AVIATION WEEK regrets the erroneous identification of engines and propellers in a picture caption in the Feb. 22 issue (p. 16).

NATO Specs Follow Gnat Design

'Want ad' for ground attack fighter appears to rule out Avro project and Snease Le Baroudeur on weight.

By Nat McKitterick
(McGraw-Hill World News)

London—North Atlantic Treaty Organization's "want ad" for a ground attack fighter (AVIATION WEEK Mar. 1, p. 22) appears to follow W. E. W. Petter's design of the Folland Gnat, Britain's first light fighter project.

Initialed by NATO air deputy Gen. Lauris Norstad, the proposal calls for 30 ground attack fighters to be delivered by January 1957. Contractor must meet the following specs:

- **Mach** .95 for 30% of mission, 350 knots for rest. Emphasis is laid on rate of roll of 100 deg. sec. at Mach .90 at sea level.
- **Clear 50-ft.** obstacle within 3,000 ft. on takeoff from grass strip if necessary.
- **Be capable** of carrying either of two types of armament: two 20-mm. cannon with 200 rounds, or two 30-mm. cannon with 120 rounds, Gyro gunsight and rocket sight is necessary, but radar ranging and tracking equipment are not, or, 12 three-in. rockets plus two 500-lb. bombs plus two napalm bombs, light armor required.
- **Empty weight** of aircraft not to exceed 5,000 lb.

▶**Equipment**—All this Norstad wants in an aircraft of rugged construction, allowing for simple maintenance needed for rapid turnarounds commensurate with high intensity operations from semi-prepared airfields.

Equipment for NATO's ground attack weapon should include pressurization installation and anti-G suit, radar homing beacon, UHF, DME (UHF homing responder), IFF, airbrakes.

Not necessary are pressurized cockpit and airborne radar. Aircraft is needed primarily for operations from zero to 500 ft., it is needed for interception only on an emergency basis for which radar homing beacon is provided.

▶**Typical Mission**—A typical mission for this aircraft would look something like this:

- 150 mi. sortie at 350 knots
- 8-10 min. search at same speed
- Attack
- 90 mi. getaway at Mach .95
- Finish sortie at low speed (presumably over friendly territory)

Tentatively earmarked for the successful manufacturer in this venture is $10 million from Special Weapons Development Fund appropriated by Congress last year. Money would go for development costs rather than for procurement.

It would cover 30 development models, which Norstad wants by January 1957.

Production orders would follow from the country concerned, perhaps supported by further U. S. financial aid.

▶**Gnat Specs**—Of the three manufacturers currently competing, the specifications look tailor-made for Petter's Gnat. Question is: Can the Gnat carry the required ground attack equipment and keep its performance?

Petter designed the Gnat as a 6,000 lb. gross-weight interceptor.

Avro's Sir Roy Dobson, whose heavier delta-wing project is competing for the contract, is betting that the Gnat cannot fulfill the ground attack role. But Avro's aircraft almost certainly will exceed Norstad's severe empty weight limitation of 5,000 lb.

▶**French Entry**—In France, Snease's Le Baroudeur delta-launched fighter also is in the running. It has the advantage of two prototypes now airborne, while the Gnat prototype, using an Armstrong Siddeley Viper jet instead of scheduled Bristol Orpheus, will not fly before next fall. And Avro's project still is in the design stage.

Le Baroudeur, in the ground attack role, would weigh in at more than 15,000 lb., which seems to rule it out.

Aluminum Producers Increase Output

More than 70 million pounds of primary aluminum from new facilities will go to independent fabricators during the first quarter of 1954.

This is 90% more than contracts with General Services Administration required the three major integrated producers—Aluminum Company of America, Reynolds Metals Co., and Kaiser Aluminum & Chemical Corp.—to turn over to the independents, GSA administrator Edmund Mansure reports.

ICAO Cuts Number Of Weather Stations

Nine North Atlantic weather stations will be operated by 12 nations starting June 30, an International Civil Aviation Organization conference has decided.

The agreement, signed at a meeting in Paris, runs for two years and eliminates one station from the present network (AVIATION WEEK Nov. 9, 1953, p. 108). ICAO estimates the reduction of one station will produce a savings of about $3.8 million annually. U. S. had contributed $17 million a year, about half the total budget.

▶**Needs 21 Ships**—North American governments will operate four of the stations and European nations the balance. The stations require 21 ships. Nations operating ships or contributing to the program: Canada, Denmark, France, Ireland, Israel, Italy, Netherlands, Norway, Sweden, Switzerland, United Kingdom and United States.

A new system was devised at the conference to figure distribution of responsibility for maintaining the stations. Two elements were used:

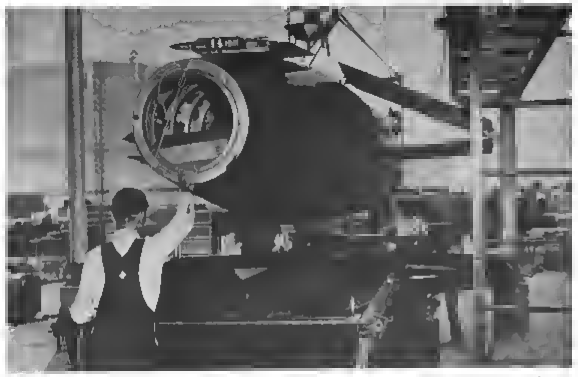
- **Aeronautical benefits**, based on the number of crossings made by aircraft of each participating nation.
- **Non-aeronautical benefits**, resulting mainly from the meteorological observations needed for weather forecasting.

Aeronautical benefits represent 80% of the program's value and non-aeronautical benefits 20%, according to ICAO.

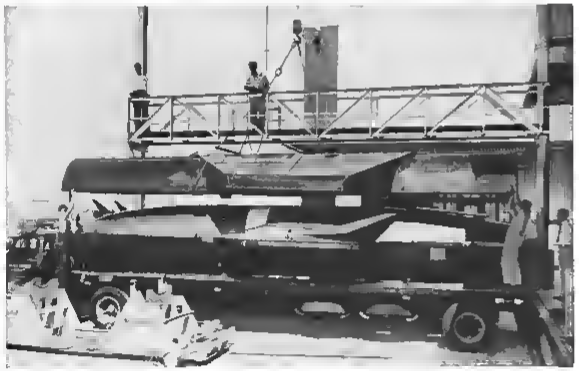
Turboprop Tradewind Makes First Flight

The 80-ton Convair R3Y-1 Tradewind Navy transport takes off from San Diego Bay, Calif., in less than 30 seconds on a shakedown maiden flight, which lasted more than two hours. The flying boat is powered by four Allison T40 turboprop engines delivering a total of more than 22,000 hp. Navy is getting a fleet of the 350-mph.-plus planes to be operated out of Alameda, Calif.

Vought Speeds Regulus Delivery



WINGS AND TAIL FOLDED to conserve space, a Vought Regulus Navy surface-to-surface missile is lowered into special container for shipment to Edwards AFB, Calif.



UPPER SECTION of container is mated to lower portion. Sealing will protect missile against weather. Truck was designed by Spencer-Sofford Loadcraft, Inc., Augusta, Kan.

READY TO TRAVEL with container rotated to minimize width of "package." This feature speeds transportation because truck need not take special route to avoid obstacles.

General Dynamics, Convair Vote Merger

San Diego—Merger of Consolidated Vultee Aircraft Corp into General Dynamics Corp., major Convair stockholder, was voted by the directors of the two firms here last week. Stockholders of both companies will vote on the merger Apr. 29.

John Jay Hopkins, chairman of both boards, will continue as chairman and president of General Dynamics. He said no changes in the management of either corporation are contemplated because of the proposed merger.

"Convair will retain its name, individual identity and organizational structure in every respect, except it will operate within the General Dynamics group," Hopkins said.

Holders of Convair stock will receive 4/7ths of a share of General Dynamics common stock for each share of Convair.

The directors intend to adopt and maintain an annual rate of $3.50 per share of the new common stock, Hopkins said.

Under the proposed merger, the two firms will employ a total of approximately 63,900. General Dynamics sales in 1953 were more than $200 million, and Convair's totaled more than $370 million.

RCAF Orders 50 Britannias, 25 P2Vs

Montreal—Canadair will begin building a prototype maritime reconnaissance version of the Bristol Britannia late this fall under a $185-million Royal Canadian Air Force contract for 50 of the four-engine transports, largest aircraft produced in this country.

In addition to the Britannias, RCAF has ordered approximately 25 P2V Neptune medium bombers from Lockheed Aircraft Corp., Burbank, Calif. The Neptune contract is estimated at $35 million.

Order for the first 20 Canadair-produced Britannias totals about $85 million, including license fees to Britain's Bristol Aeroplane Co. (AVIATION WEEK Dec. 14, p. 15), tooling and engineering costs.

The transport will be equipped with new underwater detection equipment for anti-submarine patrols, fitted with special bomb bays, heavy machine guns and devices for launching torpedoes and depth charges.

Its Proteus 3 turboprop powerplants will be replaced with Wright Turbo Compound engines to give the Britannia longer range and slower speed required for coastal reconnaissance operations.

Aircraft Noise

- **Transport design is key to problem, PNYA says.**
- **Official warns of need for better equipment.**

Los Angeles—Proper design of transport aircraft is the key to the noise problem that airlines and airports now face, says Fred M. Glass, director of the aviation department, Port of New York Authority.

"I think that we have gone about as far as we can go with present equipment," he warns, referring to efforts to meet public relations problems that have been created by transports now in use.

▶**Mandatory Steps**—The PNYA official, in an address before the Southern California section of Society of Automotive Engineers, listed two steps that those responsible for transport design must take.

• "The airline and the manufacturer, both airframe and powerplant, must consider in determining specifications and in basic design the imperative necessity for noise levels acceptable to the man outside the airplane, just as they have considered and built into every modern air transport noise levels acceptable to the man on the inside of the airplane."

• "Just as important is the necessity for flight characteristics which permit rapid climbouts and descents utilizing runways of substantially the same characteristics—both in length and approach clearances—as exist today at most of the major metropolitan airports of the country."

The problem, says Glass, has little to do with the nature of the type of powerplant—turbojet, turboprop, ramjet, or reciprocal.

▶**Acceptable Noise**—"The crux of the matter," he says, "is whether or not the given airplane has operational and noise characteristics that are acceptable in the area of the given airport. In the summer of 1953 the Comet, in our opinion, did not.

"The turboprop Vickers Viscount recently purchased by Trans Canada (Air Lines) will present little if any problem according to present indications. The Super Constellation and the DC-7 with their compound engines (Wright Turbo Compound) have been introduced into volume operation in the New York area with no apparent difficulties."

▶**Aviation 'Pearl Harbor'**—Glass recalls the "Pearl Harbor" of commercial aviation—the early days of 1952 when three large transport aircraft plowed into the center of Elizabeth, N. J., in unrelated accidents, taking a death toll of 108 passengers and crew and 11 persons on the ground.

"I hope that none of you will ever experience anything that even remotely resembles that situation that we faced in the cold dawn of Feb. 12, 1952," he told the California engineers. "Aviation had never, in my opinion, seen anything like it.

"Even in the war the bombed public face hated only the enemy's planes; they looked with affection upon their own. But in these days in early 1952 many citizens in the New York area hated every airplane and everything connected with aviation."

The problem "threatened the very existence of the industry itself," he says.

▶**Meeting the Threat**—PNYA's aviation director cites the industry cooperation to meet this threat.

"I know from a background of some 15 years in the industry the sacrifices, competitive prides and time-honored policies that went by the boards in an effort to salvage the world's greatest aviation market and to once again regain for aviation the respect and acceptance of the public which it had so quickly lost," Glass says.

He praises the work of the National Air Transport Coordinating Committee for voluntary cooperation which made it unnecessary during the crisis for any element of the industry to bow to "any all-powerful compelling hand."

He lists the following as important steps NATC took in New York:

• **Installation** of a preferential runway system that, within safety limitations, effectively is removing substantial numbers of takeoffs and landings to areas over which they will cause less or no annoyance.

At La Guardia, for example, the system has cut the use of Runway 4 for landing and 22 for takeoff from 30% of the field's total operation to 10% and less—thus eliminating a greater number of flights over one of the most congested areas in New York.

• **Institution** of specific takeoff and approach procedures to increase altitudes over communities near airports. Qualified engineering and pilot personnel determine the power and flap settings and pilot technique required to climb each separate type of transport aircraft from the runway to an altitude of 1,200 feet in the shortest possible time compatible with safety, eliminating low, flat, full-power takeoffs.

• **Elimination** of thousands of flight

Civil Plane, Engine Shipments

Aircraft industry shipped 250 complete civil planes valued at $32.5 million during December, according to a joint report of the Census Bureau and Civil Aeronautics Administration. This is 25 planes less than were shipped the previous month. November shipments were valued at $29.3 million.

December civil aircraft engine shipments amounted to 527 valued at $6.9 million. The month before, the engine industry shipped 559 powerplants.

Backlog at the end of December was 322 civilian planes of 3,000 lb. and heavier, 5% below November.

The breakdown:

	December 1953	November	December 1952
Complete aircraft	250	275	254
By weight of airframe			
Less than 3,000 lb	218	247	222
3,000 lb. and heavier	32	28	32
By number of places			
1 and 2 place	27	33	
3 to 5 place	188	214	222
More than 5 place	35	28	32
By total rated hp			
Less and 100 hp	4	11	
100-399 hp	211	236	222
400 hp and more	35	28	32
Value of complete aircraft and parts (000 omitted)	$40,938	$38,022	$25,497
Aircraft total	32,517	29,308	16,686
Less than 3,000 lb	2,095	2,311	2,395
3,000 lb. and heavier	30,422	26,997	14,291
Aircraft parts	8,421	8,714	8,811
Value of aircraft engines, parts (000 omitted)	12,909	14,296	9,923
Aircraft engines	6,892	7,171	2,272
Engine parts	6,017	7,125	7,651
Unfilled orders (number of planes 3,000 lb and heavier)	322	340	446

operations through the transfer to other airports of all possible training activity. Airlines have estimated that between 25,000 and 50,000 multi-engine aircraft operations a year are removed from the New York area by this policy.

- **Limitation** of noise annoyance from ground engine runups.
- **Establishment** of working groups and direct liaison with top industry members to insure constant effort toward solution of the problems.
- **Setting up** a complaint center for the receipt, evaluation and immediate action on reports from the public regarding flight operations near terminals.

"Our planning," Glass concludes, "must contemplate the design, operation and control of faster and more powerful aircraft in larger numbers into existing airports on a basis acceptable to a public in more congested surrounding areas than even now exist."

AF, Army Engineers Fight Over Runways

Controversy between Air Force and Army Corps of Engineers over use of concrete versus asphalt at jet air bases has been brought into the open at hearings before the House Armed Services Investigating Committee, headed by Rep. William Hess.

With backing of the asphalt industry, Army Engineers are fighting USAF's position, which holds that:

- **All "critical" areas** of jet airfields must be paved with concrete. These include all apron areas, including access ramps to hangars or docks, stub parking, washracks, calibration platforms, warmup pads, runway ends (1,000 ft.).
- **"Non-critical" areas** are to be paved with concrete also, if the cost is within 5% of asphalt.

The Portland Cement Assn. strongly supports this. USAF stand in its testimony.

Navy's policy is to use concrete in the critical areas and asphalt in the non-critical areas.

Army engineers and Navy Bureau of Yards and Docks are continuing experiments on the relative merits of the two pavement types, but there is no prospect for agreement.

▶**Contradictory Testimony**—The Army Engineers and USAF testimony presented to the Hess committee was contradictory.

- Air Force insisted the heat and turbulence of jet blasts damaged airports, meaning either curtailment of operations or hazard to costly aircraft and crews.

A statement by Gen. Curtis LeMay, commander of Strategic Air Command, declared: "The requirement ... to either prove damage before it occurs or take an inferior product is a novel approach to economy and good buying. ... We have protested new asphaltic construction consistently."

Maj. Gen. R. M. Ramey, USAF director of operations, reported that in jet operations from asphaltic pavement "deterioration is evident throughout the runway, including deterioration from high pressure tire marks in the non-critical area." He said that, by converting to concrete at one base in Korea, operations were increased 25% by eliminating time out for repairs.

- Army Engineers defended the adequacy of asphalt pavement for jet operations. Gayle McFadden, chief of the Engineers' airfields branch, testified that tests and experience demonstrated that the heat and turbulence effect of jet blasts is "minor in character and readily cured by surface treatment."

He said the softening effect from heat is "somewhat temporary, and if let alone ... the pavement will reharden again to its original condition" and that there is "no damage from the blast effect." He also minimized damage to asphalt from jet fuel spillage, stating that it could be eliminated by "good housekeeping" practices.

All of 21 complaints by Air Force against asphalt pavements, McFadden reported, were shown to be "very minor" by investigation. In one instance, he said, USAF estimated a repair cost of $25,000, but that investigation showed the improvements could be made for 50 cents.

- Navy finally backed up the USAF position on the requirement of concrete for critical airfield areas. A statement by the Bureau of Yards and Docks declared: "No bituminous surfacing yet known can withstand the heat of jet exhausts. This makes it imperative that runway ends for jet plane traffic be surfaced with concrete."
- Air Force testified that a test at Eglin Field, Fla., subjecting asphalt pavement to 385-deg. heat for 21 min. showed "serious erosion."
- Army Engineers testified that in this test, the pavement eroded to a small degree."

Dutch Inspect F-84F

Maj. Gen. Johannes A. Bach, chief of Royal Netherlands Air Materiel Command (center foreground) inspects the insides of a Republic F-84F Thunderstreak fighter-bomber during a recent visit to Republic Aviation Corp., Farmingdale, N. Y. Republic vice presidents Martin F. Scanlon (left) and Lowery Brabham (right) guided the Dutch visitor around the plant which will be supplying Thunderstreaks to NATO forces this year. The Dutch recently became the first NATO nation to take over the expense of maintaining Thunderjets supplied by the U. S. Republic's overseas subsidiary recently contracted to help Avio Diepen assume the maintenance job.

Donner Buys 47,726 Air Associates Stock

Donner Trusts purchased the bulk of Air Associates stock held by Hillsboro Plantation in the largest aircraft stock transaction during December, Securities & Exchange Commission reports.

SEC's official summary lists Donner buying 37,726 common stock shares from Hillsboro, the latter's total holding. Donner's purchase brought its total holdings to 167,472 shares. The company also bought 10,000 6% cumulative convertible preferred shares, leaving Hillsboro with +281 of that type holding and increasing Donner's holding to 10,000.

In the same month Hal A. Kroeger, a director, bought 600 common shares bringing his total to 750.

Other transactions:

Allegheny Airlines Inc.: E. K. Arnold, officer, bought 2,500 common shares, making a total holding of 3,000; Leslie C. Barnes, president, bought 200 additional common shares, making a total of 20,400; Phillip V. Mattes, director, bought 1,000 common shares, increasing his holding to 2,800; and Willard F. Rockwell, Jr., a director, bought 2,400 common shares, making a 3,000 total.

American Airlines Inc.: W. Nelson Dump, officer, sold 100 common shares, leaving 500.

Aro Equipment Corp.: Ralph A. Baird, director, sold 200 common shares, leaving 1,000.

Avco Mfg. Corp.: James D. Shouse, officer and director, bought 1,400 common shares, making a 5,050 total.

Beech Aircraft Corp.: James N. Lew, officer, bought 200 common shares, his total holdings; Lynn D. Richardson, officer, bought 200 common shares, his total holdings.

Bendix Aviation Corp.: Clarence Francis, director, bought 100 common shares, his total holdings.

Boeing Airplane Co.: Cliff Barron, officer, sold 465 common shares, his total holdings.

Capital Airlines, Inc.: James W. Austin, officer, bought 2,900 common shares, making an 8,900 total; George R. Henn, director, sold 1,600 common shares, leaving 38,572; Arthur F. Kroeger, director, sold 500 common shares, leaving 500; and Charles H. Murchison, director, bought 6,000 common shares, making a total holding of 10,000.

Colonial Airlines, Inc.: L. Orville Com-

Aviation Gasoline Sales Up Sharply

Sales of aviation gasoline in the U. S., as reported by oil refiners supplying 97% of the nation's requirements, show consumption jumped more than 200 million gallons during the first 11 months of 1953, compared with the full year of 1952. The following tabulation by states does not include jet fuel.

(*thousands of gallons*)

	1952	11 months 1953		1952	11 months 1953
Ala	7 184	16 338	Nev	3 563	2 278
Ariz	19 484	17 298	N H	363	217
Ark.	3 023	2 663	N J	71 632	63 215
Calif	428 427	466 254	N M	32 668	42,569
Colo	36 387	32 638	N Y	127 085	130 627
Conn	23 317	27,072	N C	17 954	18 787
Del	124	77	N D	1 871	1,665
D C	1 690	1 871	Ohio	34 267	40,267
Fla	96 064	102 098	Okla.	12 488	61 609
Ga.	20,204	29 802	Ore	3 025	7 510
Ida	3,666	6 183	Pa.	162 362	130 641
Ill	98 186	120 795	R. I	3 410	10,633
Ind	6,660	72 004	S C	2 838	3 351
Iowa	3 335	3,700	S D	20 278	15 621
Kan	10,660	37 141	Tenn	22 693	25 016
Ky	11 433	14 014	Tex	628 271	616 365
La	49 173	58 765	Utah	11 510	12 595
Me	2 062	6 714	Vt.	175	117
Md	16 369	22 653	Va.	60 207	68 214
Mass.	27,266	19 687	Wash	36 756	35 266
Mich.	10 068	18 899	W Va.	2 323	2,751
Minn	17 346	23,169	Wis	8 447	10 594
Miss.	2 071	6 093	Wyo	3 147	3 604
Mo	39 244	45 581	U S Total	2 227 400	2 431 906
Mont.	8 276	6 653			
Neb	7 792	6 610			

SOURCE: Yearly report of gasoline sales Ethyl Corp

eron Ulker sold 100 common shares leaving 400

Consolidated Vultee Aircraft Corp Lamotte T Cohn director sold 660 common shares his total holdings Joseph T McNarney president bought 260 common shares, making a 360 total

Curtiss-Wright Corp. George R. Hill, officer bought 600 common shares making 2 000

Flying Tiger Line, Inc. Allen T Chase director from October 1952 through December 1953 bought 600 common shares and sold 1 800 leaving a total of 1 000 William E. Bartling officer sold $6 000 worth of 5½% convertible debentures leaving $45 000 total Allen T Chase, from June through December 1953 bought $36-000 worth of 5½% convertible debentures and sold $8 000 worth leaving a total holding $28 000

Glenn L. Martin Co. Glenn L. Martin director and founder sold 20 000 common shares leaving 279 087, Everett H Pilley director bought 100 common shares his total holding

National Airlines Inc. Salim L. Lewis director sold 4 500 common shares beneficially owned through a partnership leaving 10 000

Watch that Passenger

on page 45

National Aviation Corp Frederick F Robinson officer bought 400 common shares making a total holding of 600

Northrop Aircraft Inc. William B Collins, director bought 11 400 common shares making a 53 200 total

Northwest Airlines, Inc. Wheelock Whitney director bought 200 common shares increasing his total to 300 and purchased 200 shares of 4 6% preferred making a total of 600 through Whitney Land Co he bought 200 additional preferred shares of NWA

Pan American World Airways, Inc. Erwin Balluder officer received as compensation 928 common shares making 1s 276 H M Bixby officer and director bought 1 034 common shares and received as compensation 265 additional making a 10 000 share total Others who received common stock as compensation R R Ferguson officer 394 total 1 032 Henry J Friendly officer and director 607 total 3 570 Franklin Gledhill officer and director 657 total 3 136 Harold R Gray officer 726 total 1 248 John C Leslie officer and director 573 total 1 109 H Preston Morris officer 127 total 1 316 Samuel F Pryor officer and director 657 total 8 072 and H W Toomey officer 121 total 162

Piper Aircraft Corp. W T Piper board chairman sold 1 800 common shares leaving 137 886

Republic Aviation Corp. Thomas Davis officer sold 1 100 common shares, leaving 1 320

Seaboard & Western Airlines Inc. Wallace P Neth officer and director sold 1 300 common shares leaving 426 he also sold 500 common shares held jointly with I G Neth and M A Guthrie

United Air Lines Gardner Cowles director sold 4 300 common shares held beneficially through Register & Tribune Co leaving 4 300 shares thus held Justin W Dart director sold 4 000 common shares leaving 13 000 Otis E. Kline officer and director bought 260 common shares making 2 000

United Aircraft Corp. H. Mansfield Horner president bought 5 000 common shares making a 6,066 share holding.

Waco Aircraft Co. C J Brukner officer and director bought 1,060 common shares, making a 79 666 total

TURBOPROP FIGHTERS ON PARADE—Six British Royal Navy Westland Wyvern S 4 strike fighters, powered by Armstrong Siddeley Python turboprop engines of 3,650 eshp, in a stepped up to starboard echelon Note the plane's eight blade contra rotating props. Residual thrust exhaust pipe exits just above the wing Wyvern can carry a torpedo 16 rockets and four 20 mm cannon

New U.S. and Foreign Planes on View

AERONCA SPEEDSTER—This re-engineered Aeronca 7AC Champion (left) features new wings of 28 ft span in place of conventional 35 ft span type and is powered by a fuel injection Continental C85 engine instead of standard C65 Plane has a top speed of 120 mph and is fully aerobatic says Southern Aeronautical, which developed the special modification The firm will modify a customer's Champion for $950, offers a modification kit for $200 or blueprints for $3 a set According to Southern Aeronautical, the "Super Champion" has been demonstrated to CAA and has shown no sacrifice of stability or control Southern Aeronautical's address is P O Box 609 Hialeah Fla

FRENCH TEST VULTUR ARMAMENT—Breguet 960 Vultur carrier-based attack prototype (right) in flight carrying rockets and bombs under the wings. The two-place side-by-side French naval plane is powered by an Armstrong Siddeley Mamba turboprop engine in the nose and has a 5,000-lb thrust Hisso Nene turbojet in the tail The Vultur is designed for a top speed of 560 mph and a cruise speed of 248 mph Its maximum gross weight is approximately 22,000 lb and weighs some 15,000 lb empty Span is 54 ft 3 in

HERMES A-1, first GE-designed missile, was launched in 1950. Its role in multi-million-dollar development program is told as

GE Reveals Hermes Missile Milestones

Project itself is now in process of 'redirection of effort,' but company spokesmen say, 'We're in this business to stay.'

Sandy was launched from a carrier, Pushover was deliberate destruction and C-1 was a three-stage intercontinental glider.

These code names shared a common background as phases of Project Hermes, General Electric's multi-million-dollar guided missile development program.

Hidden partly by security, partly by geography and partly by the reticence of its management, Hermes has never achieved the acclaim of many other missile projects.

Now in the process of "redirection of effort," Project Hermes has at last been permitted to make known some of the milestones it set since it was established in November 1944 by Army's Ordnance Corps. Among them:

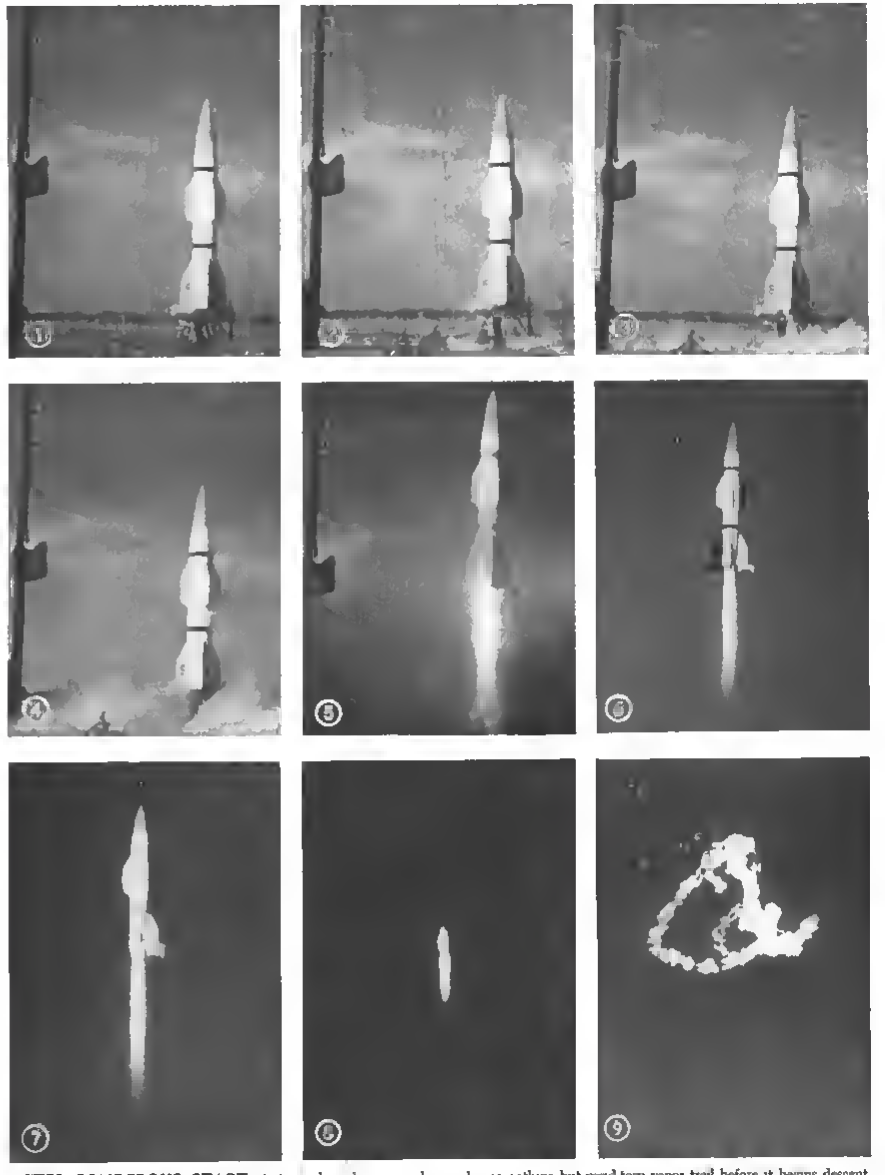
- **Hermes A-1, a rocket-powered missile test vehicle** based on the aerodynamic layout of the German anti-aircraft rocket Wasserfall. Test rounds have been fired with varying success.
- **Hermes advanced missiles,** presumably following a pattern similar to the A-1 test vehicles. Rocket-powered, these were developed to be "tactically feasible, surface-launched missiles."
- **Hermes B designs for a supersonic** ramjet missile and test vehicles.
- **Hermes C-1 design for a three-stage missile** whose final step was a hypersonic glider with a range of thousands of miles.
- **V-2 firing program,** in which GE engineers supervised the flight tests of 67 ex-German weapons modified for research (AVIATION WEEK Nov. 26, 1951, p. 23).
- **Bumper, a two-stage high-altitude** research rocket program.
- **Operation Sandy,** the launching of a V-2 rocket from the deck of the aircraft carrier Midway.
- **Operation Pushover,** the deliberate explosion of a loaded V-2 rocket under conditions simulating those of the Sandy launch.
- **Operation Blossom,** upper-air research with the V-2.

▶ **Project Personnel**—Under the direction of Dr. Richard W. Porter, the Hermes project has grown from a handful of scientists drawn from wartime programs in fire control, electronics and heat transfer to a solid group of several hundred engineers, scientists and technicians with specialties in everything from aerodynamics to telemetry.

These engineers have designed, developed and flight tested a rocket motor with the highest specific impulse of any flight article ever built. (Specific impulse is one criterion of rocket motor performance. It is the inverse of specific fuel consumption, and defines the number of pounds of thrust you get for each pound of fuel burned per second. A typical value would be 220 lb. thrust/lb. fuel/sec., or as it is correctly dimensioned, 220 sec.)

▶ **Window on Combustion**—Two Hermes scientists were curious about the internal workings of a rocket motor, and so they installed quartz windows to keep tabs on combustion. This was the

Camera Tracks Hermes Guided Missile on Skyward Journey



AFTER PONDEROUS START, test missile picks up speed, soon leaves nothing but wind-torn vapor trail before it begins descent.

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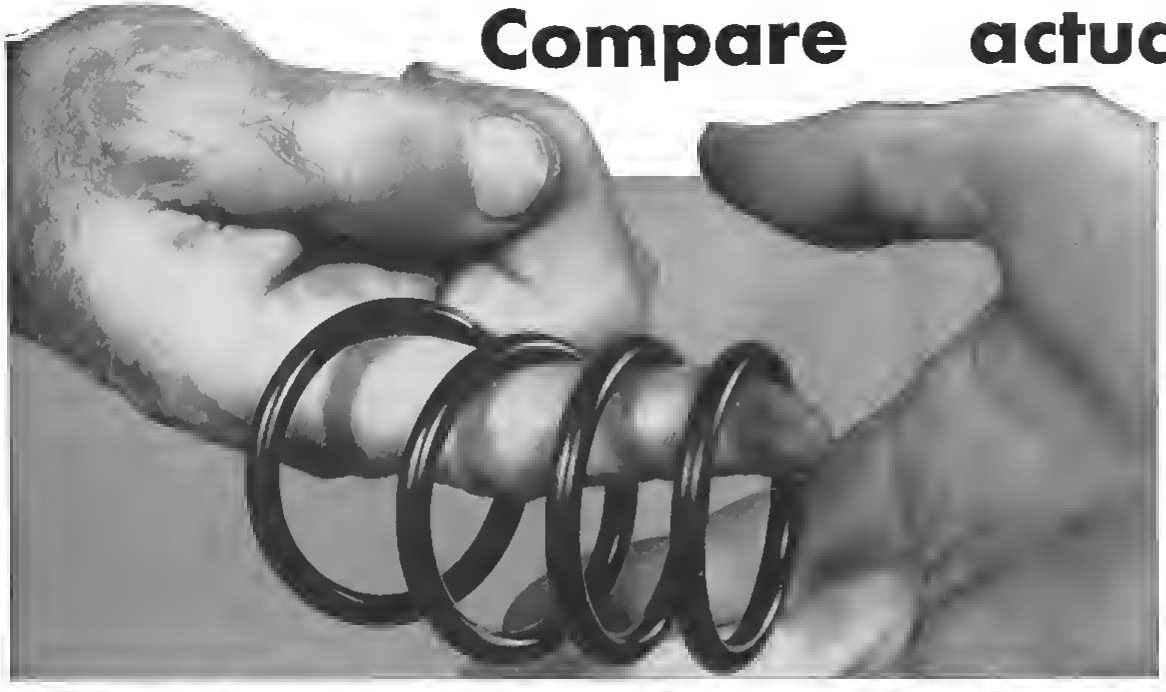

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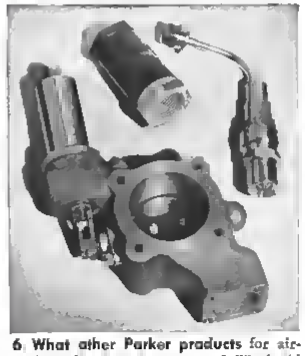

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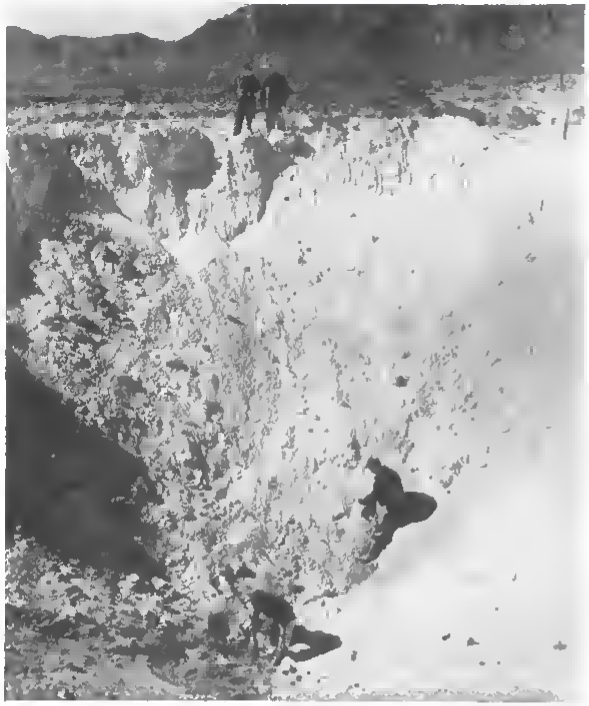

LIKE A METEOR'S CRATER, big hole marks spot where big rocket rammed earth

ROCKET TEST STAND at Malta Station can take motors up to 150,000-lb thrust.

first time the technique had been used in rocket engines.

They were able to take color movies of the combustion process through the windows, and they learned more about the vagaries of the flame front that way.

Early in the V-2 flight-test program, a CE telemetering system—for relaying test information back to a ground recording station—was tested. The system and its successful tests contributed to the advancement of the growing art of telemetry.

▶ **Bumper Payoff**—The Bumper research program provided a collection of data which never could have been obtained any other way.

Bumper combined a V-2 and a WAC Corporal research rocket into a two-stage test vehicle. The V-2 was the first step; at its burnout, the WAC was fired and added its velocity to that of the V-2.

Eight rounds were fabricated, the design was worked out on a cooperative basis between CE, the Jet Propulsion Laboratory of California Institute of Technology and Douglas Aircraft Co.

Early firings were troublesome and unsuccessful. But even the failures were successful in a sense, because they showed what was wrong. From the failures, Hermes engineers learned—the hard way—how to start a rocket motor at extreme altitude.

The problem: To start the WAC motor at the burnout altitude—about 100,000 ft.—of the V-2. At that height, the fuel and oxidizer could vaporize and explode instead of burning. Project engineers haven't stated what they learned and how they cured it.

But cure it they did, because Bumper Number Five blasted its way to 250 miles altitude and 5,000 mph., the highest speed and altitude yet reached by any man made object.

Two Bumper rounds were fired at the Air Force Missile Test Center, Cocoa, Fla. Reports said that these rockets were to be turned to a near-horizontal attitude to get aerodynamic heating data at high speed.

▶ **Fired at Sea**—Operation Sandy was a wild experience, but it proved that a rocket could be launched at sea. (This feat has been repeated by the Martin-NRL Viking research rocket, a slightly smaller vehicle.)

The fantail of the Midway was designated as the firing site, and a special cradle for holding the V-2 was designed and built. It cradled the rocket until an instant before the firing, and then fell away clear of the body.

But something went awry and the V-2, its motor developing full thrust, took off at a 45 deg. angle. It seemed to head directly for the Midway's bridge, then veered off.

"You never saw so much brass ground into the plates of the bridge so fast" recalls one CE engineer who went along. "The whole Navy beat me to the deck, and I'd been doing that kind of thing around rockets for years."

Meanwhile the V-2 ran amok well away from the carrier, swung wildly around, tumbled and broke into three pieces. That completed Operation Sandy.

▶ **Test Vehicles**—A large part of Project Hermes was devoted to work with test vehicles. One of the more unusual phases involved the modification of a V-2 rocket to serve as a flying wind-tunnel.

The warhead section, usually pressed into service as an instrument carrier, was reworked to hold a full-scale supersonic diffuser patterned after the one chosen for the Hermes B ramjet. Two such test vehicles were built and fired, one produced some excellent data on the performance of the diffuser inlet.

After reaching the point of building a complete ramjet test vehicle, the Hermes B design—along with the earlier studies of the three-stage rocket missile—was turned over to the Army Ordnance's Redstone Arsenal for further development. The Redstone missile, to be built by Chrysler, may incorporate some of the Hermes ideas.

▶ **Facilities**—Pride of the Hermes Project is its Malta Test Station, site of all the experimental rocket motor tests. Malta test stands can take motors up to 150,000 lb. thrust and down to the micro-rocket size used in tests of the newer fuels.

Liquid oxygen and alcohol, the propellant combination favored by Hermes engineers, have been joined by the rarer propellants hydrazine, hydrogen peroxide, boron hydrides. Gasoline and jet engine fuels have also been run in

LIQUID OXYGEN and alcohol gave V-2 rocket engines 50,000-lb. thrust

GE-developed rocket motors

During the early growing years of Hermes, the project kicked around from pillar to post in the sprawling, dirty GE works in Schenectady. A back room near a boiler house was one early home, followed by a series of standard offices. At one time, the Hermes project was quartered in the center of a racetrack in an all-wood building. Engineers could glance up from their sliderules and watch a high stepping horse draw a sulky past the window.

Now Hermes has its own homes, more permanent than before. The project operates out of the Campbell Ave. plant a couple of miles from the main works in Schenectady. There is a group at Electronics Park, GE's gigantic electronics center in Syracuse.

During firings, field engineers and flight test personnel are based at the Army's White Sands Proving Ground, N. M., or at the AF Missile Test Center.

▶**Current Status**—Hermes, like other missile projects, is going through a redirection of its development effort. In times past, that phrase has meant everything from changed specifications to complete cancelation of a project.

Army Ordnance has joined other services in taking a closer look at development programs under its aegis, suggesting, cutting, increasing here and there to compensate for the lessons learned in Korea and in the international arena.

Meanwhile, Hermes engineers are waiting for the definition of their next set of problems. Passive in that, they are active in negotiating with Air Force and Navy for applications of the special techniques in propulsion and guidance that were developed on the project. Both services are keenly interested.

Project management feels it has some good development products to sell. They believe the redirection will leave them in good shape, and with the added advantage of being able to take on work for more than one customer.

They say that they've staked out a big claim, and they are in the guided missile business to stay. —DAA

Dry Ice Treatment Saves Tension Pads

Economies figured at $60,000 annually are attributed to salvaging of 4-in.-square rubber tension pads at Consolidated Vultee Aircraft Corp.'s San Diego Division.

The pads are glued to test surfaces for static tests of structures. Formerly, they were removed by an electric iron or hacksaw. Both methods destroyed the pads, which cost $12 each. Now, Convair packs the pads with dry ice so they can be pried off easily and in a condition which permits re-use.

IAS Summaries

This article concludes the publication of summaries of papers prepared for the Institute of the Aeronautical Sciences' 22nd annual meeting, recently held in New York.

Previous installments appeared in AVIATION WEEK Feb. 8, p. 43, Feb. 15, p. 46, Feb. 22, p. 29 and Mar. 1, p. 30.

Electronics

▶**Current Methods and Future Needs in Selecting Aviation Personnel**—Jack W. Dunlap, President, Dunlap and Associates, Inc.

Success of an aircraft mission, civilian or military, is a function of a complex system that breaks down into a series of subordinate but equally intricate systems. These subsystems may be classified in many ways as equipment intelligence, communications and maintenance, or as strategy, tactics offense, and defense. Regardless of the reference frame selected for operational studies, they all depend on machines and men.

Ultimate effectiveness of an aircraft mission depends on optimizing the relationships between the systems of machines and systems of men. A communication system that is 100% efficient but whose success and maintenance depend on a single individual has zero value. A system of 80% efficiency which could be operated by 50% of the population would have great positive value.

Selection of aviation personnel in the future must include not only pilots, navigators and bombardiers but also gunnery technicians and ground personnel. The responsibilities of each of these must be precisely defined and evaluated against the demands on the individual in terms of his physical, mental and psychological capacities and limitations. Each increase in the complexity of equipment and in operating demands placed on the human component of aviation systems sharply reduces the subpopulation from which suitable personnel can be selected. Engineers must seek to reduce the demands on the operator. Management (civilian and military) must realistically evaluate the relationship between operational demands and the limited manpower available.

The psychologist can devise selection techniques to identify any combination of capabilities, but he cannot locate such individuals if they are not present in the general population. It will be necessary for management, the engineer and the psychologist to work as a team if the efficiency of aviation is to be optimized.

▶**The Role to Be Played by Training Devices in the Training of Aviation Personnel**—E. O. Carmody, Contracts and Sales Mgr., Stanley Aviation Corp.

When it became necessary to train large numbers of people in the efficient use of complex equipment during World War II, synthetic training showed a remarkable saving in lives, time and money when ever the education tool was properly applied. Since the war, the full employment of electronics has made possible rapid strides in the design of training devices, thus enabling required training equipment to keep abreast of the development of complex weapons. The outstanding example in wide use today is the electronic flight simulator. Because only limited numbers of new weapons will be available for training purposes, because it will not be possible to practice with some special weapons and because large numbers of people must be familiar with the application of new tools of war while others will require highly specialized training, those who govern the course of new training equipment face a major problem in planning and design. The paper on training devices points up this and other related problems and offers suggestions for their solution which stem from the evolution of this new tool over the past decade.

Aircraft Design

▶**The Flight Test Organization**—F. E. Christofferson, Chief, Experimental Flight Test, Northrop Aircraft, Inc.

Most design engineers are not capable of an open minded frank approach to flight testing; they are not capable of an objective evaluation of the results of their own work. Flight testing is, in a sense, an evaluation of engineering work and must be made by someone other than the design engineer.

The more general postulate is that those who are concerned with the quality of an airplane in any of its phases must not be subordinated to engineering, manufacturing, or sales. They must have a clear pipe line to 'top management," unimpeded by the subjectivity of the major operating functions. The "Quality Control" function has historically had separate reporting privileges but has been confined to the inspection of manufacturing only.

Those who are technically qualified to evaluate the in-flight quality of the airplane have not always had this privilege; they have too frequently been subordinated to engineering or sales. Too frequently, the practical judgment of pilots and others experienced in the operation of the product has been lost in a forest of specifications, "mission concepts," "established requirements" and scientific double talk.

It is on this basis that we argue that the flight test function should be independent, distinct and complete, reporting around, not through, any major operating function of the company.

▶**A Method of Locating the Airplane Takeoff Point and Determining the Takeoff Speed**—Jerome M. Schwarzbach, John P. Boston, and Joseph E. Jenkins, Flight Test Division, NATC.

This paper presents a method of locating the airplane takeoff point and determining the takeoff speed. This method has proved useful for those ground-run takeoff performance tests that require measurements of the total ground run and take off speed.

The necessary instrumentation, which is readily installed in the test airplane, consists of an oscillograph, a wheel revolution count transmitter, and accelerometers on each main landing gear. The takeoff runs are made over small raised strips that

TOMORROW'S AIRCRAFT: *One step closer*

Westinghouse—Rolls-Royce technical interchange advances jet development

Two world leaders in the manufacture of aviation gas turbines recently combined engineering forces through a ten-year technical cooperation agreement. As a result, Westinghouse and Rolls-Royce will exchange the wealth of design, development and production experience gained from their respective work on turbine-type power plants. This makes available an unprecedented amount of capability for jet engine development and provides the world's largest source of aircraft propulsion.

Westinghouse—Rolls-Royce can now supply turbo-prop and jet power for commercial transport, military aircraft, guided missiles and the many flight concepts still on the design boards . . . giving America's airplane builders the advanced engine designs required for successful conquest of supersonic flight.

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are spaced at definite intervals along the runway surface. The strips are permanent, are easy to install, and do not effect normal field operation. The takeoff point and speed are quickly obtained from the oscillograph record of each run.

▶**A Method for Estimating Wing Weights.** Abraham Hyatt, Research Div., Bureau of Aeronautics, Dept. of the Navy.

An equation for estimating wing weights is developed which gives reasonably accurate results. The variables included in the equation consist of the wing geometry dimensions, basic flight design weight, ultimate load factor, maximum equivalent sea level speed, and an equivalent stress factor, *f*.

In order to determine the values of *f* the characteristics of more than 50 aircraft were obtained, and the derived equation was solved for *f* in each case. A curve of selected values of *f* was plotted which may be used in the equation to estimate the weight of wings in the preliminary design stage.

Arguments are presented for the choice of the particular values of *f* on the final plot.

▶**General Design Aspects of Flight Refueling.** Lt. Col. Walter P. Mauersperger, USAF, Aeronautics Div., Directorate of Research and Development, Hq., USAF.

This paper presents a summary of flight refueling from a systems design standpoint.

Flight refueling is shown to be founded in military principles of warfare. Development is traced from its invention at the old Rockwell Field, San Diego, Calif., in 1923 through the present day. The influence of the demand for ever-increasing airspeeds and rate of fuel flow is revealed in the form of each development from the dangling hose through the looped hose, flying boom, and probe and drogue systems. Relative merits of the systems are discussed.

The several approaches toward providing a compatible tanker-bomber force, with reference to fuel available for transfer, airspeed, altitude, and convertible cargo tanker or bomber tanker vs. special tanker, are reviewed.

Because flight refueling is an auxiliary—an important one, to be sure, but still only an auxiliary—to the airplane as a weapons system, the necessity of engineering compromise from an optimum system is shown to have its own peculiar complications. This paper is essentially a primer to those new to the subject.

Meteorology

▶**Winds in the Lower Stratosphere.** R. D. Fletcher, Air Weather Service.

Demands for wind information at increasingly high altitudes precipitated a study, by Kochanski and Wasco, of existing knowledge of high-level winds. One result of this investigation was issuance of a series of maps of the average contour and temperature fields at 300, 200, 100, 50, and 25 millibars, derived from careful analysis of 4 years of upper-air data from 63 stations covering North and Central America, the Caribbean, and the eastern Pacific and western Atlantic oceans.

Also demonstrated is the feasibility of mapping the wind field to heights of 25 km. For each season, a 3-day series of charts show many small-scale features of the wind field which have a strong tendency to persist from day to day.

Success in mapping the 25-millibar fields of contour height and temperature prompted Dr. Kochanski to attempt an additional study of the 10-millibar surface (about 30 km.). Available for use were 356 temperature soundings, most of which had to be extrapolated upward above about 28 km. It was found that data were not sufficiently accurate for determination of the contour height field (hence the wind field) although good estimates of the temperature field could be made. The temperature in the lower stratosphere was found to increase with height. It was clearly demonstrated that horizontal temperature gradients at 30 km. are much less than at lower elevations. Curiously enough, the average 24-hour temperature change at 30 km. is at least twice as great as that at 10 km. With respect to seasonal variations, marked changes were observed at 30 km., with the highest means and extremes occurring in July.

▶**Atmospheric Motions Inferred from O_2 Dissociation.** M. Nicolet, The Pennsylvania State University.

By studying the departure from photochemical equilibrium conditions, it is found that vertical distributions of molecular and atomic oxygen are subject to various atmospheric processes according to the altitudes involved. It is shown how the photochemical equilibrium conditions are affected by mixing or diffusion.

Motorless Flight

▶**Design Studies for the Evolution of an Economical Towplane.** Robert C. Kidder, Flight Research Dept., Cornell Aero Lab., Inc.

This design study investigates four configurations for possible use as glider towplanes. The entire study centered around the Piper J3C Cub as a replacement for the Stearmans and Wacos presently in use.

The four configurations investigated were as follows: Stanese J3C-65 Cub consisting of two Cub fuselages each mounting a 65-hp. engine, joined so that their fuselage centerlines are approximately 7 ft. apart. The next item investigated was that of installing a 90-lb.-hp. Continental engine in the 13C airframe. The choice of the propeller proved to be critical. The performance sought is to be at least equal to that of the Stearman.

Two more configurations were investigated, and these were to determine the maximum possible performance if the designer had a free hand with the propeller diameter and rpm.

▶**Application of Sailplane Performance Analysis to Airplanes.** August Raspet, Aerophysics Dept., Mississippi State College.

Methods for analyzing the aerodynamics of sailplanes by means of flight measurements have been demonstrated in the progressive performance improvement of the sailplane RJ-5. These methods have recently been applied to the analysis of small utility airplanes and to one executive airplane. Significant in this technique is the possibility of obtaining a true measure of the pro

Pratt & Whitney Aircraft's compact J-57, pictured here, can exceed the combined power of seven 2400-horsepower R-2800 piston engines. It requires twice as many production tools to build as does the 18-cylinder R-2800 type.

The new far flying Douglas A3D, powered by two Pratt & Whitney Aircraft J-57 turbojets, is designed to be the Navy's most potent carrier-based aircraft—a major addition to U. S. Air Power. It is in the 600-to-700 mile-per-hour class.

More Power Behind the Navy's Sunday Punch

As a product of creative aircraft engineering, the Navy's big Douglas A3D attack bomber ranks high, for no other known airplane of comparable size can carry an equivalent bomb load as high or as fast. And yet it is designed to operate from the decks of far-ranging Navy aircraft carriers.

A major reason for the A3D's outstanding performance is the complete integration of airframe and power plants. From its sleek nacelles to interior ducting, this outstanding new jet bomber is designed to take full advantage of the enormous power developed by its two Pratt & Whitney Aircraft J-57 turbojet engines.

Without afterburners, the 10,000-pound thrust class J-57s can easily push the big attack plane to fighter speeds and to operating altitudes in excess of 40,000 feet. Outstanding fuel economy of the J-57 engines gives the Douglas A3D the important advantage of increased range.

Before long, increasing numbers of these potent carrier-based aircraft will be rolling from assembly lines. With other J-57-powered bombers and supersonic fighters—a whole new generation of Navy and Air Force aircraft—they will become a vital part of American Air Power, giving this nation the air strength to deter possible enemies from attack, or to meet the emergency of war if it should come.

Pratt & Whitney Aircraft's J-57 turbojet engine is indeed fully justifying the long years and intensive effort required for its development and production.

Pratt & Whitney Aircraft

MAIN OFFICE AND PLANT: EAST HARTFORD, CONNECTICUT
BRANCH PLANTS: NORTH HAVEN, SOUTHINGTON, MERIDEN
In Canada: Canadian Pratt & Whitney Aircraft Co., Ltd

ONE OF THE DIVISIONS OF UNITED AIRCRAFT CORPORATION

pulsive efficiency of the airplane, as well as the true aerodynamic drag

A means for measuring the cooling drag and data on several airplanes are presented

▶ **Measurement of Vertical Air Motions From a Glider** Paul B MacCready, Jr, Consultant in Meteorology

The vertical velocity of the surrounding air is of vital importance to a glider pilot, who ordinarily utilizes a variometer (sensitive rate of climb indicator) to ascertain the vertical motions of the glider To find the vertical air motion from the variometer reading it is necessary to correct for (1) the rate of change of airspeed and (2) the sinking speed due to the drag exerted force on the glider

This paper reviews the types of variometers available and the method of correcting for item (1) with a total energy venturi, it describes a new simple way of correcting for item (2) and shows how the resulting readings permit the use of an improved Ring scale Airspeed Selector for between thermal flight, and it describes a method of substituting audio for visual sensing of the variometer indication to improve the ease, efficiency, and safety of thermal flight

Air Tronsport

▶ **The Operational Application of Automatic Pilots** F S Bonney, Automatic Pilot Engineer, United Air Lines, Inc

This paper is based on the experience of an airline in operating electronic automatic pilots It relates some of the general problems that have been encountered during the past seven year period the advancements that have been made since the first installation, and the significance of the equipment in today's operation of five different fleets

Successful automatic pilot utilization—the goal of the operator—is the outgrowth of performance From an operational point of view, this quality may be seen in three stages—first, in the features and capabilities of the basic equipment, second in the results achieved when installed in the aircraft; and third in the ability to provide consistent performance during service

The importance of each of these steps toward the end result is shown by the features that are required in today's airline operation, in the efforts that have been expended to secure satisfactory installations and in the maintenance facilities that have been provided

The success of this program culminates with the pilot Given an acceptable degree of performance, it remains with him to put it to the fullest possible use

▶ **Operational Economics of Scheduled Helicopter Transportation** Robert L Cummings Jr President New York Airways Inc

Today scheduled commercial helicopter transportation is largely dependent on government cooperation in rendering its service to the public Actual operating and business experience being gained is immensely important to our country's future In addition to expediting airmail and helping to solve many problems concerning the movement of persons and cargo, its high potential for civil defense is recognized

This paper demonstrates the long term importance of some basic techniques and procedures that have so far been developed in the field of operation and maintenance. The paper also reflects the pioneering efforts being made to explore and tap the various commercial sources of revenue

The results thus obtained will greatly accelerate the time when more efficient and economic equipment will be available and improved operation and business methods will be adopted

▶ **Economic Aspects of Certain Aircraft Design Features and Configurations Relative to Commercial Air Transportation** Myron C Beard Chief Engineer, American Airlines, Inc

This paper deals with the economic relationship between five or six basic factors with the value of the pound with space limited and weight limited payloads, the importance of space utilization and certain aspects of the powerplant installation relative to overhaul costs

Aerodynomics

▶ **Aerodynamics of Blasts. Diffraction of Blast Around Finite Corners.** J F Ludloff, Assoc Prof of Aerodynamics, and M B Friedman, Guggenheim School of Aeronautics, N Y U

The diffraction of strong shocks around concave corners of arbitrary, finite angle, and the resulting density fields were calculated in two ways

In the first procedure, the problem is formulated in conical coordinates, consequently, the nonlinear equations of motion become essentially elliptic, and boundary conditions are imposed all along the boundary of the domain Some conditions are "floating", their number is different on different boundary sections The solution is obtained numerically, as well as by series expansion about a (revealing) singular point Agreement with shock tube interferograms is satisfactory

In the second procedure, the problem is formulated in physical coordinates consequently, the equations are hyperbolic, and only one boundary condition on a fixed wall is necessary Now there are no "floating" conditions whose location involves trial and error procedures Shocks and slipstream come out automatically as steep density gradients at the correct location The problem is being coded

The second method appears generally useful

▶ **Pseudo-Transonic Similitude and First-Order Wave Structure** Wallace D Hayes Scientific Liaison Officer Office of Naval Research London

A wave system extending from a body in a supersonic flow has a structure that is controlled by second order cumulative effects and which provides for attenuation of the energy in the wave system and increase in the entropy of the fluid

A similitude is obtained which takes into account this first-order wave structure, this theory appears as an extension of von Karman's transonic similitude for supersonic flow and has no supersonic counterpart This pseudotransonic similitude was first noted by W Vincenti for conical flows with normal Mach number close to 1 As with transonic similitude, the mean surface assumption is required, and the theory is essentially a first order one even though second-order effects are involved

The appropriate forms of the similitude are also given for the flow about slender bodies two dimensional flow and the flow at a distance from finite systems

▶ **Summary of Recent GALCIT Hypersonic Experimental Investigations** Henry T Nagamatsu, Director, Hypersonic Windtunnel C I T

The GALCIT 5- by 5 in continuous Hypersonic Windtunnels are designed for maximum stagnation temperatures of 400F (Leg No 1) and 1,100F (Leg No 2) and for maximum pressure of 1,040 lb per sq in By measurements of the static and total head pressure in the nozzle the amount of supersaturation of the air has been determined for a range of hypersonic Mach numbers For a given area ratio the condensation of air in the nozzle can be eliminated by increasing the stagnation temperature in the reservoir

An investigation was conducted in the Leg No 1 Hypersonic Windtunnel to determine the laminar boundary layer heat transfer coefficients on a cooled flat plate at a Mach number of 5 8 and, incidentally, to measure the temperature recovery factor Tests were conducted with a ratio of wall temperature to free stream temperature of approximately 6.2, at stagnation temperatures ranging from 200 to 285F A value of $Nu/Re^{1/2} Pr^{1/3} = 0\ 285$ and a temperature recovery factor of 0 858 were determined

Two 20-deg cone models were tested at a Mach number of 6 to determine the temperature recovery factor for the laminar boundary layer The local temperature recovery factors were determined to be 0 844 for Reynolds numbers from $2\ 1 \times 10^5$ to $5\ 4 \times 10^5$ A direct measurement of flat plate laminar local skin friction was made at a Mach number of 5 8

A new balance particularly suited to the requirements of hypersonic experimentation, was designed, and skin friction force measurements were made at different Reynolds numbers in one and two phase flows

On a 26 in long flat plate in Leg No 1 an extensive investigation was conducted to determine the contamination of the laminar boundary layer due to air injection from orifices near the leading edge and the turbulent boundary layer from the sidewalls The transition Reynolds number was at least 5 5 million for a Mach number of 5 8 and the laminar boundary layer seemed to be stable at this Mach number and required strong disturbances to produce transition

In the Leg No 2 Hypersonic Windtunnel the interaction of the leading-edge shock wave with the laminar boundary layer on a flat plate was investigated at a Mach number of 9 5 to correlate with theory The leading edge region for a flat plate at hypersonic Mach numbers was investigated by measuring the static pressure distribution and by using optical methods

A brief description and some preliminary results from the hypersonic shock tube are described

▶ **Effect of Windtunnel Contraction on Free-Stream Turbulence** Mahinder S Uberoi, Dept of Aero Engrg, University of Michigan

Effect of windtunnel contraction on free stream turbulence is determined by passing a well-defined turbulence through a contraction Turbulent velocity measurements show that the longitudinal component decreases and the lateral component increases in absolute value as the flow accelerates through the contraction

Corresponding to the test section of a windtunnel a uniform section was placed after the contraction Measurements show that the lateral (larger) component is losing more energy due to viscosity than by transfer to the longitudinal (smaller) component The latter is receiving enough energy to compensate for its viscous decay and in fact it is slowly increasing For most wind tunnels the time spent by the flow in the test section is too small for this equalization to occur to an appreciable degree

B-52 Tools

First of several hundred tooling sets to become available for Boeing Airplane Co's second-source B 52 program at Wichita division are examined by company's J W Kingston (left) tool fabrication general superintendent; Earl Walton, his assistant, and Hays Condiff, tool and die shop general foreman. Press plates and form dies are used to turn out gussets (seen in left foreground) for B-52 structure.

Flight Sofety

▶ **Airplane Design in Relation to Safety** R W Rummel Chief Engineer Trans World Airlines Inc

This paper presents one airline operator's view on some principles of airplane design which would ultimately produce aircraft with an even greater safety margin than those presently operated, and on the need for developing certain improvements that should further enhance safety aspects

Rocket Propulsion

▶ **Ballistics of an Evaporating Droplet** C C Miesse Aerojet General Corp

The ballistics of an evaporating droplet is studied by assuming that (1) the drag coefficient varies inversely with the Reynolds number (2) the surface area of the droplet varies linearly with time and (3) velocity of surrounding gases varies linearly with distance

As a result of this analysis, the relationships between initial droplet velocity air velocity initial and final droplet diameter, physical properties of the droplet and of the surrounding air and the dimensions of the chamber are determined The analysis is applied to problems of upstream injection in a ramjet burner spray drying with countercurrent airflow and impingement type spray collectors

A method of approximating nonlinear air velocities is given and a method for determining the effective evaporation rate for droplets in an airstream is outlined

▶ **Gas Torch Igniters for Rocket Motors** George N Woodruff Reaction Motors Inc

The author describes a method of ignition of rocket propellants whereby an independent gas supply is used to create a high temperature flame that ignites the main body of propellant The system is compared with existing systems that use pilot flame

▶ **The Toxicity and Health Hazards of Rocket Propellants** Stephen Krop Army Chemical Center Maryland

This is an analysis of the characteristics of leading fuels and oxidizers including ammonia aniline ethyl methyl and furfuryl alcohol hydrazine, JP4, hydrogen peroxide, liquid oxygen, red fuming nitric acid, from the standpoint of safety in handling

Experts Study Progress in Automation

• Varied approaches to mechanized production of electronic equipment are revealed at symposium.

By Philip Klass

A recent symposium on mechanized production of electronic equipment disclosed that General Electric has made significant progress on its program for the Signal Corps, that Bell Labs is investigating an interesting new approach, that many different avenues to automation are being explored.

Some of the country's top experts on the subject met recently under the sponsorship of the New York section of the Institute of Radio Engineers. They were largely in agreement on the many advantages of mechanized production, particularly for military electronics.

They disagreed primarily on which design approach was best.

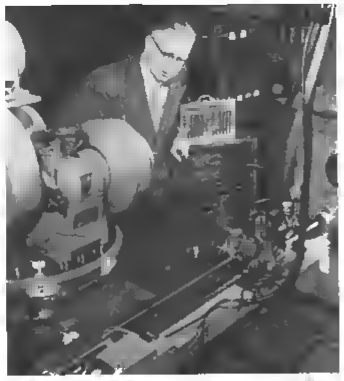
▶**The Benchmark**—The much publicized Navy National Bureau of Standards "Project Tinkertoy" (now called Modular Design of Electronics and Mechanized Production of Electronics) served as a benchmark for comparison with other programs described. (MDE-MPE is currently in pilot plant operation.)

However, Robert L. Henry, former NBS project engineer on the MDE-MPE program, said he thought it would be "unwise to standardize on a single system, even 'Project Tinkertoy,'" at this stage of automation development. (Henry recently left NBS to join the newly formed electronics division of American Car & Foundry which is headed by J. G. Reid, Jr., former chief of NBS electronics division. The two moves prompted speculation that ACF plans an MDE-MPE factory.)

▶**Diverse Approaches**—The programs at GE, NBS, Bell Labs, and two at Stanford Research Institute and Sylvania Electric (both USAF-sponsored) show a diversity of attack on the problem of automation:

• **Type of component.** The MDE-MPE uses printed capacitors, tape resistors, the GE program uses conventional components, the others require conventional components built to standardized modular dimensions.

• **Type of wiring.** Most of the programs employ printed or etched wiring in some form, but Bell Labs plans to use machine-made "woven circuits" with conventional wire and a solderless wrap-around connection.



MECHANIZED PRODUCTION of electronic equipment by automatic machines is typified by punch press (left) operated from plastic punch card and digital control (right). This setup is the first step in a General Electric program for Army Signal Corps.

HAND PRODUCTION, with row on row of manual operators, may largely disappear when industry switches to new automation techniques now under development.

• **Type of machines.** The GE and Bell Lab programs are built around large, general-purpose machines which take their operating instructions from remote punch cards or tape. The other programs employ special-purpose single-function machines which require no external control.

• **Type of production.** The MDE-MPE process is particularly suited to high-scale production whereas others are well adapted to smaller job-shop runs of a few dozen or hundred items.

Symposium chairman John Diebold, an economist who specializes in automation and author of a book on the subject, reported a tremendous increase in interest in automatic factories during the past six months. He predicted that "automation will have an overwhelming effect on the nation's future economy." One indication of interest a turnout of 450 for the symposium, with some visitors from as far away as Ohio.

▶**GE's Automatic Punch Press**—GE's Walter Hausz—manager of the advanced electronics lab at Ithaca—described and showed movies of an automatic punch press which takes its operating instructions from a vinyl punch card and electronic digital computer. The device serves as a proving ground for GE to test the precise digital control techniques which it plans to employ in automatic factory machines under development for the Army Signal Corps.

The GE-Signal Corps program, first disclosed in AVIATION WEEK (Nov. 17, 1952, p. 36), is designed around the use of printed circuit boards and conventional components. First phase of the program calls for developing a machine which will accurately position printed circuit boards so that component pig tail leads will drop through appropriate holes on the board when deposited by the machine.

After all of the components are in place, they are secured and connected by dip soldering. GE expects to deliver such a machine this summer.

Second phase of the GE program, scheduled for completion by mid 1955, is to develop machines to test components automatically, cut and form their leads, and transport them to the component placement machine.

▶**Proving Ground**—The component placement machine is being designed to position printed circuit boards (from one to 12 in. square) with an accuracy of 0.001 in., deposit components at rate of 30/min.

To develop a suitable control system, GE adapted an operationally similar device, the Weidemann (Model RA41P) turret punch press which normally uses a pantograph template arrangement to enable the human operator to position his work.

GE replaced the operator's pantograph handle with two pneumatic pistons, one moving in the "X" direction, the other in the "Y" direction. It substituted a plastic 8½ x 11 in. punch card and electronic control for the normal metal template. The tiny holes in the plastic card are translated into work position by a binary coded, decimal control system. Photo transistors keep tab on work position, providing feedback to the control system.

Hydraulic cylinders are attached to the air pistons to provide damping. "Slow down" and "stop" valves in the cylinders are actuated by the control system as the work nears and reaches its final position at which point a collet grips the shafts to prevent displacement during the punching operation.

Hausz admits that the present model is not as speedy as a fast human operator working a conventional Weidemann, but he feels that redesign can increase operating speed. Meanwhile, GE plans to put the device to work in its Syracuse plant to get some operating experience.

▶**The Big Advantage**—The Signal Corps and GE think their approach to automation—conventional components, general purpose machines operated from punch cards—is better suited to military needs where quantities are usually small, design changes are frequent. Lt. Col. J. V. Fill, chief of the Signal Corps Squires Lab which is sponsoring the GE program, cited these advantages to AVIATION WEEK:

• **Uses proven components.** Much money and effort have gone into the development and improvement of standard JAN components in contrast to still-unproven Navy NBS printed capacitors and tape resistors.

• **Less restricting.** Present Navy NBS module is large compared to present subminiature construction techniques because air is used for insulation between wafers. MDE will limit further size reduction, Lt. Col. Fill believes, an important consideration to the Army, which must pack its electronics on its back.

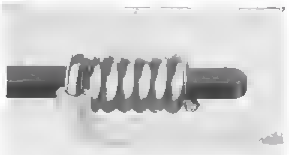
• **More versatile.** General-purpose machines can be changed over quickly to handle design changes or to produce new items, merely by inserting a new punch card and changing components in the hoppers. This facilitates short production runs, increases machines' utilization.

▶**Suitable for Job Lots**—The importance of low-quantity production was emphasized by Hausz's report that the dollar volume of job-lot production was approximately twice as great as high-quantity business at GE's electronics division in Syracuse. Hausz pointed out that plastic cards for the automatic punch press can be inexpensively prepared and checked for accuracy in 15-30 minutes compared to a day or more required to make and check the complex metal template which it replaces.

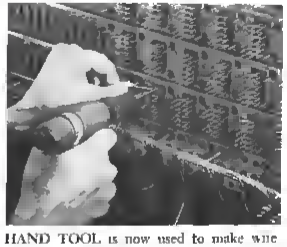
▶**Solderless Connection**—One of the basic techniques used in the Bell Labs' approach to automation might prove attractive for avionic application, despite the fact that the overall program is aimed at meeting the operational needs of the Bell System, where reduced size and weight are less important considerations.

Information disclosed by R. F. Mallina indicates that the recently announced solderless wrapped connection, developed by Bell Labs and the keystone of their automation program, might be superior to soldered connections even under aircraft vibration conditions.

▶**Wrap-Around**—The new solderless connection is made simply by wrapping five or more turns of solid-conductor wire around a terminal, using a hand or power tool to assure proper tension. The terminals are square or rectangular-shaped so their edges cut tiny notches in the wire, preventing the wire wrap from twisting, and giving a wire-to-terminal contact area 10 times the cross section of the wire, Mallina reports. Shearing action during the wrapping operation cleans any oxide off the wire.



BELL LABS' aid to automation is built around its recently developed wire wrap technique for making solderless connections.

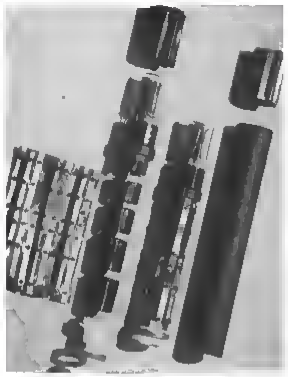


HAND TOOL is now used to make wire wrap connections. It would be replaced by machine with multiple wrapping tools.

WIRE WRAPPING permits closer terminal spacing, more compact construction.

At first it was thought that a tight wire wrap connection depended upon maintaining internal stresses in the wire, set up during the wrapping process. Lab tests indicated that at room temperature it would require about 40 years for these stresses to be reduced 50%, making it quite satisfactory for Bell System use. However at elevated temperatures of 150C, Mallina reports, 50% stress relaxation took place within 24 hours, which would appear to make the technique unsuited for avionic use.

▶**New Evidence**—Mallina says, however, that recent data indicates that solid-state diffusion between wire and terminal takes place over a period of time when the terminal is constructed of suitable material. This effect, he indicates, counteracts the stress relaxation



SYLVANIA'S APPROACH to mechanized production is the cylindrical module (left) which is assembled in machine (right). Process was developed several years ago by company under USAF sponsorship, but only recently disclosed.

with age under high temperature conditions.

▶**Better Than Soldering**—Mallina believes that the new wrapped connection has many advantages over a soldered connection:

• **Stronger.** The abrupt change of cross section in a soldered connection at the point where wire joins solder localizes stresses at that point and thus weakens it. In wrapped connection there is no abrupt change in cross section, less localization of stresses.

• **More uniformity.** Quality of soldered connections is difficult to control, depends entirely on skill of individual worker. With new Bell technique, a calibrated wrapping tool assures uniform connections.

• **No heat damage.** With wrapped connections, there is no danger of damaging heat-sensitive components.

• **Closer spacing.** New connection permits closer spacing of terminals and wires without risk of burning adjoining wires as with soldering.

• **Cleaner.** With wire wrap, there is no rosin to clean off, no tiny pieces of snipped wire to shake out.

Mallina reported that tests show that wire-wrap connections last two to 10 times longer under vibration than soldered connections (using solid conductor wire). Mallina believes that if the solid-conductor wire and wrapped connection were substituted for multi-strand wire now used almost universally in aircraft and avionics equipment, reliability would be improved.

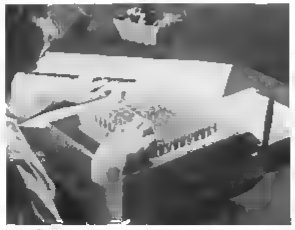
The symposium audience viewing a Bell Lab movie, gave oral evidence that it was impressed by the speed of the wire-wrap process. An unstripped wire was placed in a slot in the wrapping tool (spindle), the tool placed over a terminal, and in a split second the wire was stripped of insulation and wrapped. Multiple spindle operations which handled several wires simultaneously were even more impressive.

▶**A Cue From Textiles**—Inspiration for Bell Labs' approach to automation comes from the textile industry where machines handle and interconnect thousands of fibers, more delicate than wire. Mallina pointed out that a hosiery machine makes ten thousand interconnections in a pair of ladies' nylon hose for less than a dollar.

As Mallina envisions it, the system would use components of conventional construction, built to standardized modular dimensions and with terminals suitable for wire wrap. These would be machine mounted on eight inch square fiber boards so that components are located on one side, their terminals protruding through holes (spaced at ½ in. intervals) to the other side.

Operationally, the machine which installs the components will resemble the GE Signal Corps device and be operated from punch cards or tape.

▶**Wire Weaving Machine**—The mounting board will then be transferred to the wiring machine, which also takes its operating instructions from cards or tape. The machine will feed wire to two wrapping spindles, position the board and spindles over the required component terminals, then drop down and make the wrapped connections. The board and spindles would then be repositioned for the next operation.



PUNCH CARDS which provide operating instructions for GE automatic punch press (pictures p. 42) are prepared on this device resembling conventional adding machine.

An experimental machine, capable of making 15 connections per minute has already been constructed. Mallina believes that a 60 spindle machine could work as fast as 60 girls using manual techniques and cut costs by 90%.

Although machine-made wiring may be preferable to printed circuits for telephone company use because of the ease with which circuit changes can be made, it does not appear to have widespread application to airborne avionics equipment.

▶**MDE MPE**—The Navy launched its MDE MPE program at NBS after a study which indicated that any future shooting war would require 10 times more electronics than was used in World War II. It therefore asked NBS for an automatic factory design which would cut manual labor content and cost could be easily mothballed in peacetime, be quickly activated in event of war, Henry said.

Other design objectives included a system which could produce a wide variety of different equipments, having good reliability, and whose size and weight were comparable to conventional construction techniques. The result was the now familiar MDE module using a stack of ceramic disks, printed capacitors, tape resistors. (For details, see AVIATION WEEK Oct. 12, 1953, p. 72.)

▶**Still Being "De-Bugged"**—The present pilot plant outside Washington is being "de-bugged" and improved by the Kaiser Electronics Division of Willys Motors, which operates the facility for the Navy. Henry admitted that plant output is currently running around 200,250 modules/hour, only 20-25% of its design capacity because of a high percentage of rejects. Asked about rejection rates, Henry said that "anything under 50% is presently considered good."

One of two machines principally responsible for the high rejection rate has been modified, Henry said, and the other, the module assembly machine, may require basic redesign. He emphasized that present machines represent the first attempt at automation, that much higher yields can be expected in the future as the machines are refined.

Despite current problems, chairman Diebold called the Navy program "the most important single development in automation to date."

▶**USAF Programs**—The Stanford Re-

search Institute approach, resulting from a three-year USAF-sponsored study, resembles the GE Signal Corps approach in some respects. It employs components of conventional construction which are machine-mounted on printed-circuit boards, then dip soldered. Major differences are the requirement that components have standardized dimensions (in modular increments of 0.1 in.) and the use of several component placement machines instead of one.

In an SRI type automatic factory, one machine would install 1-watt resistors, another might handle ½ watt resistors, a third would place tubular capacitors, and so on. A single machine would be able to mount several components of the same physical size but with different resistance or capacitance values. By means of cams, a machine will be sequenced to position the mounting boards and feed components from different hoppers.

▶ **Advantage**—One of the advantages of using several single-purpose machines is that a manufacturer can mechanize his factory on a piecemeal basis, reducing the initial investment, according to Freeman Horn of SRI. By changing a component attachment head, Horn says, an SRI machine can be quickly and easily converted to handle different-sized components.

Unlike GE, which will use separate machines to straighten, cut and form component leads, these operations will all be performed by the same SRI machine which mounts the component. In addition, the machine will clinch the component leads after mounting to give added support.

Based on several experimental component placement machines which SRI has built, Horn predicts that a production version could install a component in 0.4 second.

▶ **Speedy New Etch Process**—As a part of its study program (there are no present plans to build a pilot plant), SRI has developed a speedy new technique for marking printed circuits. It substitutes a nitric acid etch and stencil process for the older photo engraving, cutting processing time from 35 minutes to only three minutes, Horn reports.

SRI has also investigated different chassis configurations for mounting machine-made printed circuit assemblies which are adaptable to mechanization. SRI is now giving increased study to the economics of automation, to find out where and when its higher cost can be justified.

Horn believes that an SRI-type automatic factory is economically feasible for production quantities under 50,000 units a year.

▶ **Program at Sylvania**—If the USAF program at Sylvania appears less ambitious than others, there is a logical explanation. Although publicly revealed for the first time at this symposium by W. H. Hannahs of Sylvania, the project was completed several years ago.

"TINKERTOY" MODULE, product of the country's first automatic factory, serves as a benchmark for comparing other automation techniques now under development.

The company's approach is based on the use of standard component construction with modular standardization only of component diameters. A complete stage (one tube) is packaged in a cylindrical aluminum can measuring 1½ in. in diameter of whatever length is required.

Each modulator stage consists of several shorter cylindrical sub-modules. Some contain slots around their periphery into which resistors and capacitors are placed. Others contain transformers and larger components.

These sub-modules are placed in a machine which wraps a synthetic rubber "corset" around them. Component leads pierce the corset and are then machine-soldered to copper strips running lengthwise on the corset to provide necessary interconnections (picture on p. 44).

The upper sub-module mounts a miniature tube and corrugated shield which serves to conduct tube heat to the outer aluminum can when it is installed.

▶ **Note of Dissent**—Hannahs, in reporting on Sylvania's several years of study and development, expressed doubts that any single system yet developed can be justified economically or is versatile enough to meet the fast-changing needs and markets, both consumer and military, of the electronics industry.

Despite this, there is growing interest and activity in automatic production of electronic equipment. Stanford Research Institute and the USAF are jointly sponsoring a two-day symposium on the subject, Apr. 19-20, at the Fairmont Hotel, San Francisco.

Whatever the present limitations or the future of "Project Tinkertoy," it undoubtedly has hastened the day when the sight of row upon row of girls with soldering irons becomes a thing of the past.

NEW AVIATION PRODUCTS

Engine Cowl Mounts Resist Tension Fatigue

Longer life and reduced maintenance costs on aircraft cowl installations are said to be provided with a new series of center-bonded cowl mountings.

In the center-bonded design, rubber is bonded securely to center sleeve and pre-compressed inside outer sleeve. Company says this relieves possibility of tension fatigue encountered under previous designs with high radial loading. Ends of outer member are rolled over to insure against possibility of slippage in service.

Elastomer in unit is a specially developed synthetic rubber which reportedly has more resistance to oil and ozone that the elastomer previously used.

Lord Manufacturing Co., Erie, Pa.

Tiny Motor Powers Fans and Blowers

A 1/400 hp. miniature permanent magnet motor that has application for small fans, blowers and similar light weight load items has been developed by Dalmotor Co.

Total weight of the motor, designated PM-47, is 5 oz. Designed for continuous duty, the motor draws 0.18 amp. at 27 v. d.c. Dimensions are 1.18 in. long by 1.8 in. diameter, and the .4 in. diameter shaft has an extension length of 1.4 in. Other lengths and special arrangements, including splines, gears, etc., can be provided. Various electrical connections are available.

Dalmotor Co., 1375 Clay St., Santa Clara, Calif.

Electric Connectors Resist Environmental Extremes

New AN E series of multi-contact electric connectors, designed to resist extreme environmental conditions encountered by aircraft, is being made by Cannon Electric Co.

Company reports units provide for high dielectric strength with greater arc resistance, water repellancy, resistivity, corrosion resistance and a higher potential test voltage and contact current.

ratings than have previous specifications

Circuits through connector are completely sealed from cable to cable as a result of insulator and grommet design. Cannon notes that this provides safety factors far beyond specification minima.

Two available insert materials are featured: new and lighter polychloroprene and shells of single-piece construction with integral clamps.

Cannon Electric Co., 3209 Humboldt St., Los Angeles 31.

Turret Indexing Units Give Variable Dwell Time

New clutch-operated series of turret indexing units suited for applications which require a variable or infinite work cycle—or where the operator is required to determine the indexing cycle by push-button control—is now on the market.

Designed to supplement the range of applications served by the company's direct drive turret indexing units, the new models are available with 8, 16, 24 or 32 work stations and 20-in., 30-in., or 40-in. turret diameters. Maximum indexes per hour range up to 2,154. Limit switches may be used to prevent indexing before any given operation is completed.

Swanson Tool and Machine Products, Inc., Erie, Pa.

ALSO ON THE MARKET

Solvents for cleaning and degreasing of electric motors, generators, relay switches, transformers and like electric equipment, as well as precision tools and machinery, and plastics, metal parts and painted surfaces are offered by Nocon Products Corp., 62 William St., New York 5, N. Y.

Rosan stud and insert all-purpose kits are available for use in product development, overhaul, salvage, service and replacement work. Each kit contains one size of inserts or studs with locking rings, installation tools and directions for use, packaged in a metal box—Rosan, Inc., 625 Coast Highway, Newport Beach, Calif.

Funds Continue to Favor Aircraft

Air transport holdings lean toward senior equities or shares of carriers with no mail subsidy problems.

Manufacturers of investment trust funds continue to look favorably on aircraft manufacturing shares, while airline equities continue in disfavor. This is shown by an AVIATION WEEK round up of changes in aviation and general type trust portfolios in 1953.

The trusts examined in the study include National Aviation Corp., Aeronautical Securities, Inc., Aviation Group of Institutional Shares, Inc. (now known as Foundation Fund), Aviation Fund of Croup Securities, Inc., Massachusetts Investors Trust and Wellington Fund.

▶ **National Aviation Corp.**—The largest specialized aviation fund, National Aviation Corp., again demonstrated a successful management record last year, making its portfolio shifts of particular interest. Significantly, as of Dec. 31, 1953, 63.3% of the total market value of its total investment portfolio—aggregating more than $9 million—was in aircraft shares, almost unchanged from the organization's 63.1% participation a year earlier.

The total airline investment of National Aviation was down to 24.3% at the 1953 year-end from 33.7% the previous year. Analysis reveals that airline common stocks comprised less than 10% of the total investment portfolio—the bulk of air transport commitments were in senior securities.

Cash and U. S. securities rose sharply to 12.4% at the 1953 year-end from 3.2% a year earlier.

National Aviation reported net profit for 1953 of $3.07 per share on 477,274.6 outstanding shares. This compared with 1952 earnings of $2.80 per share. During 1953 total dividends aggregated $2.50 per share, of which $1.58 represented capital gain distributions.

In 1952 total dividend disbursements amounted to $2.40 per share. Dividend payments represent an average return of slightly more than 10% on the recent market quotation of the company's stock and is of the same yield level prevailing for 1951 and 1952.

National Aviation's indicated value of its net assets at the 1953 year-end was $10.4 million, or $23.23 per share. The aircraft portfolio with total cost of 53.9 million had a market valuation of more than $6.5 million as of the same date. Airline investments however, with a total cost of almost $2.7 million carried a market valuation of $2.5 million.

▶ **Last Year's Changes**—During 1953 the aviation fund's principal changes included:

• **Increases.** 10,000 Collins Radio, 3,400 G. M. Giannini & Co., 1,500 North American Aviation, 16,000 American Airlines (common), and 7,400 Eastern.

• **Decreases.** Most of the portfolio activity was centered in decreasing commitments—8,900 Bell, 4,500 Boeing, 8,500 Grumman, 4,275 Lockheed, 11,550 Republic, 2,000 United Aircraft, 2,500 American Airlines (preferred), 10,000 Braniff, 11,000 Delta, and 25,000 Pan American.

Reflecting all changes during 1953, National Aviation's aircraft portfolio at the year-end consisted of 20,500 Bell, 7,490 Bendix, 13,000 Boeing, 10,000 Collins Radio, 10,000 Curtiss-Wright "A", 10,500 Douglas, 14,000 Garrett, 3,400 G. M. Giannini, 1,800 Greer Hydraulics, $75,000 Greer Convertible Debentures; 20,475 Lockheed, 10,000 Glenn L. Martin Warrants, 39,000 North American Aviation, 15,950 Republic, 9,350 Thompson Products, 18,000 United Aircraft.

Airline investments at the same date were fewer in number and concentrated as follows: 36,000 American, 8,200 American Convertible Preferred, $420,000 Delta Convertible Debentures; 18,900 Eastern, 10,000 Helicopter Air Service "A", $300,000 Mid-Continent Airlines Convertible Debentures, 2,750 New York Airways, 10,000 United Air Lines, 2,300 United Air Lines Convertible Preferred.

Among the aircrafts, the largest dollar investment at 1953 year end market quotations were in Douglas ($867,563), United Aircraft ($839,250), and North American ($823,875). In the airline group, the largest commitments were in American ($991,700—common and preferred), Eastern ($422,888), United Air Lines ($415,150—common and preferred).

▶ **Aeronautical Securities, Inc.**—National Aviation's successful operations last year were evident in themselves and by contrast with other specialized aviation funds.

During 1952 Aeronautical Securities

Inc., which formerly operated as a specialized aviation trust with indifferent results, converted its $1 million of assets to a general type fund.

▶**Aviation Group**—In December 1952, another specialized aviation fund, the Aviation Group of Institutional Shares, Inc., with resources of $1.8 million, presumably also found it desirable to convert to a general-type fund and changed over to the designation of "Foundation Fund."

In this operation aviation securities at Dec. 1, 1953 comprised only 6.7% of its total portfolio.

▶**Aviation Fund**—The only other specialized aviation trust now remaining is represented by the Aviation Fund of Group Securities, Inc.

This $1.6-million fund at Nov. 30, 1953 had a widely diversified portfolio which consisted chiefly of 11,000 American, 9,000 Braniff, 4,500 Eastern, 3,500 National Airlines, 5,200 United Air Lines, 2,700 Boeing, 8,000 Convair, 3,000 Curtiss-Wright "A", 1,800 Douglas, 7,500 Lockheed, 9,000 North American Aviation and 4,500 United Aircraft.

▶**Mass. Investors Trust**—The largest general type fund, Massachusetts Investors Trust, with total resources of $523 million, increased its aviation investments to $9,316,000 at the 1953 year end from 1952. Its holdings were concentrated as follows: 80,000 United Aircraft, 125,000 North American, 20,000 Grumman and 30,000 Douglas Aircraft.

Significantly, MIT's total aviation commitments centered in but four aircraft companies, nevertheless exceeded the entire investment portfolio of National Aviation Corp., a specialized aviation fund.

▶**Wellington Fund**—Wellington Fund ran counter to the general trend, and during the year sold 6,700 Bendix, 10,000 Douglas, 24,000 Lockheed, and 20,000 United Aircraft.

Its sole remaining aviation commitments were in 60,000 American Airlines and 25,000 shares of United Air Lines' stock.

As a group, however, general-type funds have made increasing commitments in the aircraft group. This is a reflection of the greater stability of earnings and dividends of the manufacturers in recent years.

The airlines remain in decided disfavor among professional fund managers. Where commitments do exist in this category they are found primarily among the major trunks who do not have any mail pay subsidiary problems to feel out their outlook.

(Factors contributing to low investment evaluation of the airlines were discussed in AVIATION WEEK Feb. 22, 1954, p. 51.)

—Selig Altschul

EAL-Colonial Veto Raises NAL's Hopes

- **Eisenhower kills proposed Board-approved merger because Eastern assumed early control of small line.**
- **National 'delighted' by chance to renew two-year-old offer, scheduled for further consideration by CAB.**

President Eisenhower has killed the proposed Eastern Air Lines-Colonial Airlines merger because EAL assumed premature control of the smaller carrier. The action paves the way for National Airlines to reopen its bid for Colonial.

The President reversed the decision of Civil Aeronautics Board, which approved the merger last summer and sent it to the White House for endorsement. Officials of both airlines were surprised at the President's decision.

▶**Violation Recognized**—CAB's approval of the merger recognized that EAL violated Section 408 of the Civil Aeronautics Act in acquiring control of Colonial (AVIATION WEEK Aug. 10, p. 55). However, the Board explained that Eastern's power over Colonial did not influence or affect the subsequent execution of the merger.

The savings in subsidy paid to Colonial was cited by the Board as another point in favor of the merger. Nevertheless, the President's order made clear that although such mergers could strengthen the nation's air transport system and reduce the subsidy burden, they should be accomplished in accordance with the Civil Aeronautics Act. That was the point on which the merger was rejected by Attorney General Herbert Brownell when the case came to his attention late in 1953.

Control of Colonial was acquired via stock purchases by various Eastern directors through Smith, Barney & Co.

▶**Colonial View**—Colonial's management called the President's decision "a keen disappointment," and added "We firmly hoped that approval would be granted because of the benefits that would have been received by Colonial stockholders, employes, taxpayers and the traveling public.

"We have at all times acted with complete independence and without knowledge of any alleged 'power to control' by Eastern. It was solely on the basis of such independence that the merger agreement was made and fully supported," Colonial said.

▶**New Offer**—Additional comment of its "regrets that benefits that would have resulted cannot be accomplished at this time," led observers to speculate that the merger agreement may have been killed only for the present.

On hearing of the President's decision, T. F. Armstrong, Eastern president, wired Branch T. Dykes, president of Colonial, offering to sign a new agreement. This strengthened the belief that EAL will take up the fight anew at a later date.

▶**National Delighted**—Happiest at the Chief Executive's reversal of CAB was National, which signed the original merger agreement with Colonial. This was later vetoed by Colonial's stockholders in favor of Eastern's higher bid.

National now stands a good chance of moving into the picture again. The Board, in its opinion on the action, said it would give further consideration to the National-Colonial merger that received full hearing in connection with the proposed Eastern merger last spring.

C. T. Baker, National president, said he was "perfectly delighted" at the outcome of the case.

"The White House is to be congratulated," he said. "This only proves that the President meant it when he said his Administration would be one of law rather than one of men."

▶**Little Surprised**—Airline industry observers for the most part seemed little surprised at the outcome of the proposed merger. They said the Administration was forced to put itself on record as approving only issues developing in strict accord with the aeronautics law.

Any other decision would have left the President open to much adverse criticism, observers said. However, Eastern maintained before the agreement went to the President that for the government to interfere in normal business dealings merely to help a smaller business is contrary to Republican Administration policy.

Airlines Study Airlift Mobilization

Groundwork is being laid by a 14-member committee representing the government and airlines to mobilize the nation's air transport industry in time of war.

Established by Civil Aeronautics Board, the newly formed Industry Advisory Committee on Aviation Mobilization is headed by Joseph H. Fitzgerald, director of CAB's Bureau of Air Operations.

As a start, the group will establish operating procedures and assign working groups to handle the vital problems involved.

CAB is asking immediate advice on these questions:

- Basis for establishing the quantity of airlift required to provide sufficient air transportation to maintain the civil economy and defense effort at the same time.
- Basis for estimating the portion of total traffic requirement that must be moved by all-cargo aircraft.
- Personnel, maintenance facilities, ground facilities, including airports, which are required to produce the necessary lift.
- Principles that should govern allocation of available air transport capacity among civil carrier routes.
- Criteria governing establishment of a standby contract to permit off-route operations by certificated carriers and governing contracts to be entered into for the lease of aircraft between carriers as required.

Members of the new committee include:

- R. W. Ireland, vice president, United Air Lines, Paul H. Brattain, vice president, Eastern Air Lines; Willis G. Lipscomb, vice president, Pan American World Airways, Robert L. Turner, vice president, Northeast Airlines, Arthur V. Norden, executive vice president and treasurer, Seaboard & Western Airlines; C. C. West, Jr., vice president, Continental Air Lines, Theodore Hardeen, Jr., administrator, Defense Air Transportation Administration.

Leigh C. Parker, vice president, Delta-C&S Air Lines, William E. Hollan, vice president, Slick Airways, Harding L. Lawrence, vice president, Pioneer Air Lines, A. D. Lewis, director-economic planning, American Airlines; Earl B. Smith, director of transportation and communications, Defense Department; A. G. Thomson, Jr., president, Argonaut Airways Corp.; and John H. Clemson, general traffic manager, Trans World Airlines.

NAA Wants to Set Up New Austrian Airline

North American Airlines is negotiating for a contract to supply Austria with an airline.

Since no peace treaty has been signed with Austria by the four governing powers (U. S., France, Great Britain and Russia) the country is unable to organize its own airline. North American officials have been discussing plans for an Austrian national airline with Austrian officials in Washington.

▶**Two DC-6Bs Ordered**—Airline officials will fly to Vienna for further talks with Austrian government leaders. The Austrians are reported to be anxious to get an airline in operation by the beginning of the tourist season June 1. Whether that will be feasible was speculated last week.

The new Austrian national airline would operate with four of North American's DC-4s for intra-European service and two DC-6Bs for trans-Atlantic service. The nonskeds expects delivery of two Douglas DC-6Bs late this fall, according to current plans.

The agreement with the Austrians probably would be similar to the one Seaboard & Western Airlines has with Irish Aer Lingus (AVIATION WEEK Jan. 5, 1953, p. 92). In that case, Seaboard, scheduled to begin the Irish service last April, was blocked by an Irish stipulation that Lockheed Constellations be used. S&WA has not received Connies, which are on order.

▶**No Direct Service**—Should the Austrian negotiations be successful, North American sees the possibility of obtaining DC-6s from a source other than the manufacturer in order to time its inaugural service with the tourist season.

Big immediate advantage of having their own airline is seen by the Austrians in trans-Atlantic transport of tourists from New York to Vienna. No direct service is available now. Travelers to the Austrian capital must make several stopovers en route from the U. S.

Vienna is served by Pan American World Airways, British European Airways, Air France, Scandinavian Air System, Swissair and El Al Israel.

▶**Approval Expected**—Austria is one portion of the world where Allied relations with the Russians are fairly amicable, and the Austrians expect little difficulty in obtaining four-power approval for the new airline.

The airline would be an Austrian company. North American would supply the equipment and crews on a contract basis. Airline officials see no reason why the company could not continue domestic U. S. operations while supplying the Austrians.

Although negotiations are far from complete at this stage, the Austrians are understood to be urging the plan, looking forward to their share of what observers believe will be a highly lucrative European tourist season this summer.

Meanwhile, North American is involved in a Civil Aeronautics Board enforcement hearing that last week adjourned from Washington to Los Angeles, where it opens Mar. 10.

Sen. John Sparkman on the floor of the Senate asked the Senate Interstate and Foreign Commerce Committee to examine "very carefully whether any group outside the Board is dictating the Board's campaign to put a smaller competitor out of business."

He commented: "The Board seems to be intent on putting North American out of business before it can be heard on its application to serve the public."

Samoan Airlines Chiefs Make Plans

Looking over plans for inauguration of air service to American Samoa, recently recommended by a CAB examiner (Aviation Week Feb. 15, p. 94) are George J. Murphy (left), financial backer, and Lawrence M. Coleman, president of Samoan Airlines. The carrier plans to use 24-passenger Convair PBY-5A Catalinas on four roundtrips weekly between Pago Pago and Apia, British Samoa. Murphy says he hopes the airline eventually will be able to expand its operations to Hawaii.

Lee Defends Cutback In Safety Personnel

Civil Aeronautics Administration's elimination of regional safety chief posts and diversion of authority to industry is defended by CAA Administrator Fred B. Lee as "designed primarily to yield a more positive and effective discharge of our safety responsibilities."

In a letter to Sen. Pat McCarran, who objected to the changes (AVIATION WEEK Jan. 25, p. 16), Lee stated:

▪ **Elimination** of Aviation Safety Division chiefs in regional offices "will automatically convert the three former branches of the Aviation Safety Division to three divisions: The Air Carrier Safety Division, the General Safety Division, and the Aircraft Engineering Division."

This change, he adds, elevates the three units of the regional organization "and reflects the fact that the activities for which they have the field execution responsibility are largely separate, major programs. . . ."

McCarran objected that elimination of the regional safety chief created a situation similar to a police department with a homicide division, a robbery division, and a traffic division, with no police chief, leaving direction up to the mayor.

• **Observing that CAA's** safety inspectional and enforcement practices took form prior to World War II when aviation was in an "adolescent stage," Lee maintains that the industry is now capable of assuming greater authority. McCarran objected that CAA was going too far too fast on this score.

"All transport aircraft manufacturers and all our large-scale air carriers now have seasoned organizations comprised of specialized departments which are largely staffed at the professional level with hundreds of thousands of personnel of mature training and experience," Lee says.

"Government cannot effectively maintain a detailed surveillance of an industry of such size and complexity of operation with the number of government personnel which the Congress and the taxpayers are willing to provide. It is our belief, also, that government can be fully effective in discharging its aviation safety responsibilities only if it so administers the program as to utilize the great technical and managerial capacities of the industry itself in working toward the goal of safety."

Britain Pushes Air-Sea Mergers

(McGraw-Hill World News)

London—Britain's Tory government is working to merge private airlines with established merchant marine companies in an effort to provide capital for the air operators.

These air-sea alliances have taken place so far:

• Peninsula & Orient Steam Navigation Co. bought a majority interest in Britavia, holding company that owns Silver City Airways and Aquila Airways. Silver City operates a very successful network of cross-channel car ferry services. Aquila keeps alive Britain's shrinking heritage of flying boat operations with services to Madeira, the Canary Islands and, later this year, to Capri.

• Furness Withy Lines acquired a substantial interest in Airwork, Ltd., Britain's largest independent. Among other things, Airwork has an application before the U. S. Civil Aeronautics Board for a trans-Atlantic airfreight service.

• Clan Line Steamers merged with the Hunting group of aviation companies into Hunting-Clan Air Holdings. Hunting runs scheduled services between north of England cities and points on the continent.

▶ **Unusual Alliance**—On the surface, the fact that private ship owners and aviation companies should find so much in common appears unusual. But many big operators in Britain's merchant marine are convinced they cannot fight air transport development, so the wise course for them is to get into the airline business.

Donald F. Anderson, managing director of the P & O Lines, sums it up this way: "Either some form of equilibrium must be established between sea and air to allow each to do what it is economically fitted to do, or sea will soon have to be subsidized or air transport will simply wipe us out."

▶ **Indispensable Item**—From the independent airlines' point of view, the ship owners have one indispensable item to offer capital. The out-of-date, assorted equipment now flown by most private operators here (AVIATION WEEK Dec. 14, p. 112) is inadequate for any development plans.

None of the air-sea mergers so far has started capital flowing into the aviation companies. But the day may not be far off. Airwork, for example, will need freighters to exploit its trans-Atlantic franchise. Chances are to get equipment quickly, Airwork will buy Douglas DC-6As.

Shippers' capital resources relatively are quite large. While the present state of the merchant marine business has not warranted buying new ships, alternative investment in aircraft may seem a good prospect. Much less money is tied up in an aircraft order than in one for a ship.

▶ **Route Fights**—Even if the shippers do start to spend money on aircraft, the ultimate success of these mergers will depend on routes and services made available to the independents.

Here the hopes of the private operators run against opposition from the big nationalized airlines. British Overseas Airways Corp. and British European Airways are fiercely jealous of their exclusive carrier rights.

Through several Labor Party MPs in Parliament, both corporations have been attacking government attempts to foster private air operations.

▶ **Aviation Policy**—The Labor MPs have tried to pin down Minister of Transport and Civil Aviation Lennox-Boyd about his policy. They want to know if it is government policy to reserve freight and charter services exclusively for the independents.

Specifically, they want to know if the minister has prevented BOAC from applying for an all-freight trans-Atlantic service in deference to Airwork.

Lennox-Boyd refuses to be pinned down. He insists his policy is that the services of private and public operators should be complementary more than competitive. But BOAC can apply for permission to run a trans-Atlantic freight service. The airline's job would be to convince the Air Transport Advisory Council, the British version of CAB. The minister denies he has exerted influence on BOAC in any way.

▶ **Second Thoughts**—On the basis of market research data compiled more than a year ago, the air carrier tentatively decided against an all-freight service across the Atlantic.

BOAC inquiries for five Bristol Britannia freighters have come to nothing so far for this reason. Now, apparently, the corporation is having second thoughts because of initiative of independent Airwork.

BOAC also has crossed swords with the independents over colonial coach flights, services between the U. K. and empire points on which private operators are allowed to charge fares 10% below British Overseas' tourist rate.

Only five of 25 colonial coach applications have been granted so far, but BOAC already is worried. The corporation claims independents are skimming the cream of traffic off these routes, leaving only an uneconomic residue.

Whether the ship owners will open their coffers to aircraft investment very far depends on how successful BOAC and BEA are in resisting the invasion of the independents into their sprawling empires.

—N McK

Pacific Aircoach Boom Forecast

(McGraw-Hill World News)

By A. W. Jessup

Tokyo—Trans-Pacific commercial aviation will undergo major changes after aircoach service goes into effect Apr. 1, airline representatives here forecast.

Hopes are that the new fares, roughly 25% below those of first-class service, will lead to development of a mass passenger load for the Pacific air routes. But no one discounts the possibility that aircoach may be simply a reduction of general fares.

Airlines are troubled with the difficulty of providing the service in conformance with International Air Transport Assn. regulations and, at the same time, maintaining maximum schedule frequencies.

▶ **Combined Service**—Japan Air Lines, the Japanese flag carrier, will provide combined service on its Douglas DC-6Bs from Japan to Honolulu and the U. S. West Coast. The section aft of the main entrance will seat 12 first-class fares, forward, there will be space for 47 tourist passengers.

U. S.-flag lines—Northwest Orient Airlines and Pan American World Airways—will start with separate tourist and first-class services. NWA probably will put on one flight weekly and maintain its regular thrice weekly, first class Boeing Stratocruiser service.

Pan American, now operating seven Stratocruiser flights per week each way across the Pacific, will switch three of these flights to tourist class at the beginning. Later, it probably will provide combined service.

▶ **Service Extensions**—PAA wants to maintain its service frequency, considered of utmost importance in getting business. From Tokyo westward toward Europe, the airline will introduce combined tourist-first-class service with its DC-6Bs. The latter actually is an extension of a dual service in effect between Europe and New Delhi.

Later, Pan American may extend its Stratocruiser service around the world. The company ran a test flight into Hong Kong, missing link in the round-the-world operation, last year. Another test run with Civil Aeronautics Administration officials aboard tentatively is set up for this month. If it is successful and meets the approval of CAA, then PAA's entire operations may be changed drastically.

The company then might put its Stratocruisers on full deluxe round the-

world service, using its DC-6Bs for tourist travel Or it might offer combined service on the Boeing transports

The aft compartment of the Stratocruiser is set up for first-class passengers By installing a movable bulkhead and using removable seats, Pan American would provide a flexible loading arrangement for both types of airline passengers

► **Aircoach Impact**—Much depends, however, on what effect the tourist fare has upon business. Airlines salesmen expect a large number of regular air passengers still will want to ride first-class. Many have discovered the advantage of a berth on the long trans Pacific flight, enabling them to get a maximum of rest and to arrive in Tokyo, San Francisco, Los Angeles or Seattle ready to go to work

First class attractions will be spruced up More frills, fancier and better food, free liquor, and some additional personal prestige will be given first-class travelers There also will be more space and more comfortable seats than for the tourist traveler

► **Hopes and Fears**—But everyone in the airline business here expects many present first-class fares will switch to the lower coach rate So fearful were the lines of this reaction that at the Honolulu IATA meeting all carriers agreed not to publicize the new service, at least until March 1 They feared an earlier announcement would dry up traffic for March, lead to staggering losses

All airlines hope the lower fares will lead to a large increase in passenger business.

Touring Americans have visited Europe in droves during postwar years, but few have ventured to the Orient Perhaps a lower fare will bring them out in droves to see different and "exotic" Asia Japan, for example has been inadequately developed and propagated by the government-backed travel agency, Japan Travel Bureau JTB needs a complete overhaul but is unlikely to get it, being a government monopoly

Another source of new business the new low fare may open up is persons who travel between the U S and Far East by freighter because the fare has been considerably cheaper Now the difference will be slight

► **Customer Reaction**—If the vacation and tourist travel develops some airline observers expect a single lower fare may result from the new change

The airlines want happy customers they do not want travelers to arrive home from an Orient journey with bad memories of experiences on airplanes They want passengers to tell about fine food, good service, comfortable seats, etc

Thus it will be difficult for the airlines to maintain for long a distinctive difference between the two types of service Also, if there is a marked decrease in overall business as a result of economic developments in the U S, American carriers expect their foreign competitors will press for extension of first-class service to the lower class fare

► **Problems**—Northwest Orient provides some indication of the magnitude of the problem The company has three flights weekly to and from the U S Currently, its weekly passenger load averages 75 in winter months and nearly 150 during the summer By adding a weekly tourist service Northwest automatically requires an additional 60 passengers per week, or it may cancel one of its first class flights, substituting coach service

The difficulties are great because the first-class passenger wants to travel at specific times If he wants to leave on Wednesday, when the tourist flight leaves he probably will look for another routing rather than wait until Friday or Saturday for the next scheduled first-class flight

Canadian Pacific Airlines another carrier operating across the Pacific, probably is in better shape at the start of the new service Since early last year it has provided emigrant fares from Hong Kong and Tokyo to North and South America This service was provided in coach seats with first-class service Therefore, CPA's DC 6Bs are all set for the two types of service

SHORTLINES

► **Aircraft Industries Assn** reports President Eisenhower and five other top government officials traveled a combined total of 397,000 miles by air during 1953

► **Air Jordan** has inaugurated twice weekly service between Amman, capital of Jordan, and Damascus, Syria

► **American Airlines** plans to begin daily, nonstop DC-7 flights next month from Washington, D. C., to San Francisco, Los Angeles and San Diego

► **Allegheny Airlines** flew 213,666 persons 31,610,000 passenger-miles last year, an increase of more than 18% over 1952 Mail ton-miles gained 12%, and air express ton miles climbed 9% President Leslie O Barnes reports passenger miles continued to increase during the first part of this year, forecasts an upward trend throughout 1954

► **British Overseas Airways Corp** and officials of Germany's Luftag have agreed to set up a permanent committee for Anglo German cooperation on civil aviation BOAC reports New York Jamaica passenger traffic increased 112% last month over February of 1953

► **Civil Aeronautics Administration** has published a booklet on "Operation of the Air Traffic Control System" that describes federal airways communications network and navigational aids

► **Cubana** carried 7,092 passengers on Havana Miami flights in January an increase of 35% over 5,020 for the first month of last year. Varadero-Miami traffic gained approximately 80% to 706 passengers and 665 persons used Cubana's newly inaugurated Havana Mexico City service

► **Lake Central Airlines** has started scheduled DC 3 service from Lima Ohio to Columbus and Indianapolis

► **North Central Airlines** has flown approximately 98 million revenue passenger miles since start of operations six years ago, has built up its fleet to 19 DC-3s and expanded its system to a 2,659-mi network covering 44 cities

► **Panair do Brasil** has resumed weekly flights from Rio de Janeiro to Sao Paulo Brazil, and Lima Peru with 41-passenger Constellations The service first was started in 1951 but was suspended after several months of operation

► **Panagra** has logged its 20,000th cross

ing of the Andes mountains on flights between Chile and Argentina.

▶**Trans World Airlines** reports domestic and international aircoach traffic increased 43.5% during the first seven weeks of this year over the same period of 1953 . . . The air carrier will inaugurate daily roundtrip Sky Tourist service Mar 11 from Washington, D. C., to St Louis, Kansas City and the West Coast . . . TWA has carried more than 55,000 passengers on Super Constellation flights

CAB ORDERS

(Feb 17-25)

ORDERED

Braniff Airways application in additional Southwest Northeast service case be severed from that proceeding and returned to the calendar for hearing in due course

Hawaiian Airlines and Trans Pacific Airlines to show cause why the Board should not fix, determine and publish their mail rates

Certain fourth-quarter information supplied by Allegheny Airlines, American Airlines, Eastern Air Lines, Helicopter Air Service, New York Airways, Northeast Airlines, Pan American World Airways, Piedmont Aviation, Trans World Airlines and Western Air Lines be withheld from public disclosure.

Investigation to determine Alaska Airlines' rate for transport of mercury from McGrath to Anchorage, Alaska

DENIED

Applications for temporary exemption for Central Airlines, submitted by Fayetteville, Ark., Ft Smith, Ark., Ft Worth, Tex., and Kansas City, Mo

DISMISSED.

Application of Aviation Corp of Seattle on fares from Anchorage and Fairbanks to Seattle for transport of passengers on freighter type aircraft

Proceedings that provided reduced fares for group travel instigated by Northwest Orient Airlines

APPROVED

Intercompany agreements between Pan American World Airways and Capital Airlines and various other carriers

Continuation of Braniff Airways temporary nonstop service Bogota, Colombia-Rio de Janeiro-Sao Paulo, Brazil and Balboa, Canal Zone-Rio de Janeiro-Sao Paulo

EXEMPTED

North Central Airlines temporarily to travel over Segment 5 of Route 86 beginning Mar 27

EXTENDED

Suspension until May 29 of coach fares Burlington, Vt.-New York, N. Y., or Newark, N. J., as filed by Colonial Airlines

SUSTAINED:

Appeal of bureau counsel's opinion in the mail rates case of National Airlines

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FEATURE PAGE

Strictly Personal

SEATTLE

To retain his objective attitude, it is sometimes necessary for a reporter to get out and see how the other half lives.

Therefore, to gain what might be called a before-and-after viewpoint on Boeing's jet transport, we rode the train from California to Seattle—our first overnight trip by rail in more than 10 years.

How the other half stays in business remains a mystery.

One comparison was obvious. In the time it required to travel from Los Angeles to Seattle by rail we could have flown on American Airlines DC-7 from Los Angeles to New York, returned to Los Angeles and flown back to New York again—with time out between flights for a few beers.

All this in the old-fashioned airplane with propellers.

We made the rail trip on the San Joaquin Daylight and the Cascade, prides of the Southern Pacific Railroad.

► **Square Wheels"**—Just north of a California town with the somewhat improbable name of Manteca, an errant mail bag became entangled with the emergency brake in the mail car and brought the pride of the Southern Pacific to a screeching halt. After a 15-20-minute delay, the Daylight proceeded northward at something less than top speed since the sudden halt had given us what one trainman quaintly referred to as "square wheels."

This produced what might be called in another medium a violent case of tail sway of the type encountered when the tail is about to depart from the rest of the fuselage. The noise which accompanied this condition was somewhere above the level of a B-36 takeoff.

The porter departed rapidly from the vestibule with the explanation, "I'm not going to be standing here when those wheels come off."

► **Limping Onward**—From that point on we regarded the trip with a feeling somewhat like that you get when you turn on final approach and spot an ambulance and fire trucks waiting at the end of the runway.

We limped onward fortified by frequent announcements over the loud speaker that baggage could be collected at the station entrance and that cross-fertilization of the Smyrna fig by the fig wasp first took place in Fresno.

To give credit where credit is due it is only fair to note that such historic announcements were made over the Southern Pacific's loudspeaker system long before the airlines discovered the great longing many pilots have to be disc jockeys.

For someone who is constantly hearing about the noise that airplanes make, it was a pleasure at one point to note that a small boy standing beside the tracks was holding his hands over his ears as the train went by.

In addition to expenditures over and above the fare made necessary by tipping and high priced meals, there was a "special service charge" on the Daylight of one dollar.

A timetable revealed that this charge was levied upon anyone rash enough to occupy a seat. Just where one should ride to escape this service charge was not made clear.

► **Hour Late**—Thanks to our square wheels we arrived at Martinez, transfer point to the Cascade, almost an hour late—a single engine emergency as it were.

With the exception of certain personal negotiations with the conductor made necessary by the fact that the young lady who sold us our ticket neglected to include a seat on the Portland-Seattle portion of the trip, the remainder of the journey was uneventful.

We conducted a brief poll in the dining car as to why those aboard were traveling by rail instead of by air. Several pointed out somewhat acidly that while a Western Airliner was missing, the Cascade Limited was not. End of poll.

This benevolent attitude toward the railroads suffered somewhat when the dining car check arrived. It is worth mention that we had to wait in line for more than an hour to get into the dining car.

► **Aviation Logistics**—It was with nostalgia that we looked out the window at one point to see four flatcars loaded with drop tanks from Fletcher Aviation Corp. It is obvious that the railroads have an important role in the transportation picture—as logistic support for aviation.

The scenery, however, was magnificent and there was no service charge. We'll try it again in another 10 years. —William J. Coughlin

AVIATION CALENDAR

Mar. 22-25—Institute of Radio Engineers, national convention, Waldorf Astoria Hotel and Kingsbridge Armory, New York.

Mar. 29-31—Aero Medical Assn., 25th annual meeting, Statler Hotel, Washington, D. C.

Apr. 5-6—Society of the Plastics Industry (Canada) Inc., 12th annual conference, Mount Royal Hotel, Montreal.

Apr. 5-7—National Fluid Power Assn. first annual meeting, Edgewater Gulf Hotel, Edgewater Park, Miss.

Apr. 5-8—American Management Assn., 23rd National Packaging Exposition, Convention Hall, Atlantic City, N. J.

Apr. 12—Society of Automotive Engineers, second annual Aeronautic Production Forum, Hotel Statler, New York.

Apr. 14—National Advisory Committee for Aeronautics symposium on helicopter research for American Helicopter Society, Langley Field, Va.

Apr. 14-16—Society for Experimental Stress Analysis spring meeting, Netherlands Plaza Hotel, Cincinnati.

Apr. 19-20—Symposium on automatic production of electronic equipment, sponsored jointly by Stanford Research Institute and USAF, Fairmont Hotel, San Francisco.

Apr. 21-24—Second annual student paper competition for undergraduates and graduates, sponsored by Institute of the Aeronautical Sciences (Texas Section), Adolphus Hotel, Dallas.

Apr. 22-23—Joint meeting of Radio Technical Commission for Aeronautics, Franklin Institute Laboratories, Institute of the Aeronautical Sciences (Philadelphia Section) and Institute of Radio Engineers (Philadelphia Section), Franklin Institute, Philadelphia.

Apr. 22-23—American Institute of Electrical Engineers conference on feedback control, Claridge Hotel, Atlantic City, N. J.

Apr. 29-30—Ninth annual Industrial Engineering Conference, co-sponsored by Society for Advancement of Management and American Society of Mechanical Engineers, Statler Hotel, New York.

Apr. 29-30—American Society of Tool Engineers, 10th biennial industrial exposition, Convention Center, Philadelphia.

May 4-6—1954 Electronic Components Symposium, Department of Interior Auditorium, Washington, D. C.

May 5-7—Third International Aviation Trade Show, managed by Aircraft Trade Shows, Inc., 71st Regiment Armory, New York.

May 5-7—American Welding Society second Welding & Allied Industry Exposition, Memorial Auditorium, Buffalo, N. Y.

May 16-19—American Association of Airport Executives national convention, Louisville, Ky.

May 17-20—Basic Materials Conference, produced by Clapp & Poliak, Inc., International Amphitheater, Chicago.

June 14-19, 21-23—Two courses in automatic control, University of Michigan College of Engineering, Ann Arbor. Registration deadline Apr. 15.

June 21-24—Institute of the Aeronautical Sciences annual summer meeting, IAS Building, Los Angeles.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—MARCH 8, 1954

LETTERS

Federal Airport Aid

The following may be of interest as an elaboration of my remarks before the Wisconsin State Aeronautics Commission, recently reported in AVIATION WEEK (Jan 18, p 86)

Expanding on these remarks, in which I stated that federal aid results in delays and hampers efficient work in all but very large projects, I might point out that I was speaking of the Federal Airport Act as presently written and administered and applied to specific Wisconsin projects set forth in the preliminary program before the Commission and other projects under the Commission's jurisdiction It should not be assumed, however, that very large projects are entirely free of the problems outlined.

Under Wisconsin statutes, the Wisconsin Aeronautics Commission serves as sponsor's agent for all state and federal aid airport projects, including financial dealings and project relations with the federal government, and has been doing so since 1947 During this period the Aeronautics Commission has concurrently had under its jurisdiction projects financed with state aid alone and projects financed with both state and federal aid, and has encountered the following major difficulties with federal aid airport projects We have persuasive evidence indicating that the difficulties are not limited to this state

- Uncertainty of the availability of federal aids authorized for appropriation under the Act
- Absence of satisfactory coordination and complete cooperation with the state in the formulation of the National Airport Plan
- Burdensome regulations for the administration of the Act
- Excessive and inflexible airport design standards that make it difficult, if not impossible, to justify undertaking some essential airport improvements with federal aid
- The high cost involved in supervising and administering federal airport aid projects
- Difficulty in complying with provisions of the Act which require approval by the Secretary of Labor on wage rates paid on airport construction projects financed with federal aid
- Difficulty in establishing private aviation on airports developed with federal aid due to the policy of CAA to discourage long term leases and lack of provision in the Act authorizing airport owners to sell tracts of land to private individuals for aviation businesses on airports financed with federal aid.

The foregoing difficulties have the cumulative effect of making many projects undertaken in the state, financed in part with federal aid, cost more taxpayers' dollars, and take longer, than if federal aid had not been used, and at times have made it difficult to get private aviation industry established permanently in a satisfactory manner on the airports after they were completed In my judgment and that of many of those with whom I come in contact, the Act and the Regulations should be amended to eliminate these difficulties

The National Aviation Trades Assn recently conducted a nation wide survey of leasing conditions on public airports that is factual and revealing . . . The declared purpose of the Federal Airport Act is to bring about a national system of airports for our economic welfare and national security Presently the functioning of the Act has been interrupted by the Congress, and various groups are studying the policy of federal aid for public airport development What the outcome will be is unknown, but it is certain that it will be at least a year and more likely two, before the answers are known In the meantime we are going ahead with airport improvements to the extent that funds will permit Obviously our progress will be less than it has been and many needed improvements will be indefinitely postponed

Since public airport development in Wisconsin didn't get well under way until 1947, and has accomplished only about a third of its projected civil airport program, it is expected that the effects of the postponements will be felt immediately, and accompanied by a "flattening" in the aviation growth curve in this area I understand that this might not be true in areas that have extensive World War-II-created airport facilities to fall back on

T K JORDAN, Director
Wisconsin State Aeronautics Commission
343 State Office Building
Madison 2, Wis

Flutter Trouble

I was struck by the close similarity of the reports in your Feb 1 edition on p 16 between the BOAC Comet 1 crash and a crash of a jet fighter which I helped analyze Although from long and sad experience I know how difficult reconstruction of failure sequences can be, sometimes an intuitive hypothesis can lead to the right answer

Since many of the Comet accidents have occurred at low altitude (where high "Q" conditions prevail) and were thought to have been "explosions" I would be primarily suspicious of high frequency, probably antisymmetric elevator-horizontal stabilizer flutter leading to the described sequence of tailplane failure which would naturally be followed by abrupt pitch and wing failure Such dynamic failures are often much more plausible than "over-control" in explaining horizontal tailplane failures since tailplanes are usually adequately stressed to account for any static control loads I would suggest that the Comet people confer with the dynamics branch at WADC, especially regarding flutter of aircraft with full-powered elevator controls

S A KRIEGER, Vice President
Planning Research Corp
941 Westwood Boulevard
Los Angeles, 24 Calif

Navy 'Censorship'

Please cancel my subscription to your magazine

Your article in AVIATION WEEK of Jan 18 and the accompanying editorial on "unscrupulous bureaucrats" who attempt to impose "political censorship" was so far from the facts of the case that I can no longer feel any confidence in the objectivity of your material

My subscription address is given below

E G DANKWORTH, JR
Bureau of Aeronautics, Navy Dept
Washington, D C

Many thanks indeed for your letter of Jan 19 and the copy of the editorial from AVIATION WEEK which you enclosed The matter had been called to my attention about a week before, and I brought it directly to the attention of the Secretary of the Navy I am sure you will see that there will be a change in the instructions very shortly

JAMES C HAGERTY
Press Secretary to the President
White House, Washington, D C

(Mr Hagerty refers to an "alerting" the previous week when AVIATION WEEK showed advance page proofs to Assistant Secretary of Defense Seaton on unwarranted security restrictions on Navy contractors in connection with release of information. The regulation is being rewritten, as Mr Hagerty points out —Ed)

Copter Reporting

I have told many people how impressed I was with George Christian's article about the Sabena helicopter operation. There can be no question that your treatment of the subject marks an all time high in journalism as far as helicopters in particular are concerned; and perhaps equally so as far as air transport in general is concerned You have my congratulations, and I am sure my views are shared by every fair thinking individual who read your outstanding story.

CLARENCE M BELINN, President
Los Angeles Airways, Inc
Box 10155, Airport Station
Los Angeles, 45, Calif

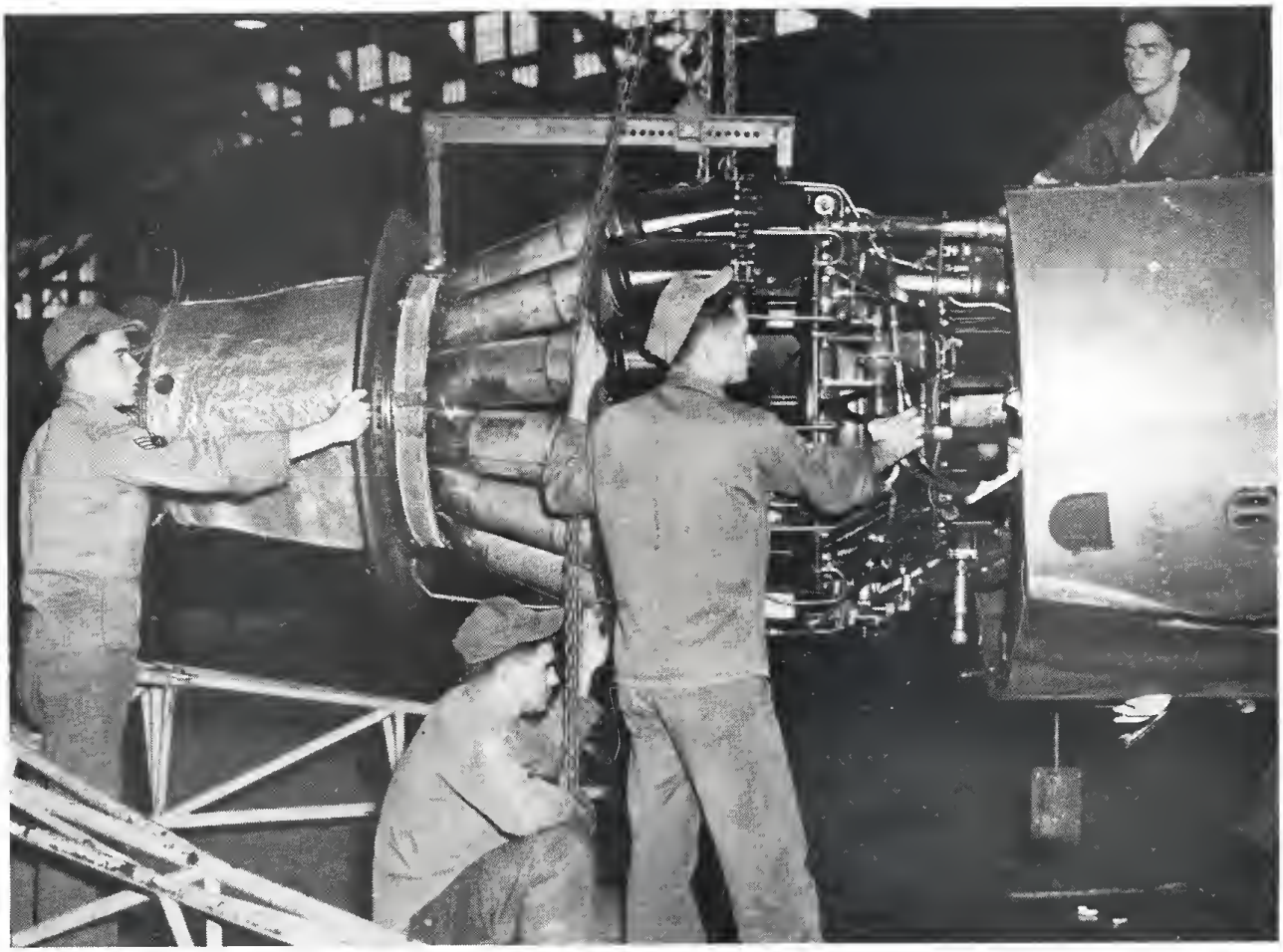
Ex-Stewardess Speaks

I agree with your "bachelor" staff member as per your editorial on stewardesses in the Feb 22 issue—that maturity is preferable to youth and beauty, but is it synonomous with age? It would take a bachelor not to know when a gal is too old! No one can convince me that an unmarried female in her mid-thirties (yes, we all know there are lots of old gals flying) has the stamina, strength and reaction time equal to one in her twenties

If you don't mind, I'll take my chances with the well trained youngster who can "snap to" in a hurry

MRS ROBERT B ALEXANDER
171 Mamaroneck Road
Scarsdale, N Y

P S Although I don't usually write "Letters to the Editor" I couldn't resist writing my views on the subject especially as I am, besides being a pilot's widow, an ex-scheduled (PAA) and nonscheduled stewardess and still under that age limit!



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An Allison-powered Lockheed F-80 Shooting Star flew 1200 hours in combat and combat-alert service in Korea without major overhaul. That flight time adds up to more than 600,000 miles under tough combat conditions. The record represents a splendid job on the part of the 6160th Maintenance Squadron at Itazuke AFB, Japan.

Records like these are made by planes and engines—but it's the men behind the planes who make them possible. A hearty salute to the 3561st and 6160th Maintenance Squadrons for these splendid achievements.

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